

Self-Fulfilling Prophecy in Self-Regulated Learning:
How Quality Information About an Instructional Medium
Impacts on Achievement and Satisfaction

Inauguraldissertation zur Erlangung des akademischen Grades einer
Doktorin der Sozialwissenschaften an der Universität Mannheim

vorgelegt von
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im März 2006

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Acknowledgments

I would like to thank all the people who have helped me to realise this dissertation. First of all, I would like to thank my supervisor Prof. Dr. Manfred Hofer for his committed encouragement and feedback throughout the various phases of this dissertation. Likewise, I would like to thank my colleague Dr. Stefan Fries for his willingness to critically discuss my work at different stages in the generation of this work, as well as my boyfriend Oliver Dickhäuser for always having an ear for my concerns during the past year of writing-up and his persistence in persuading me into some recreational time-outs so I could go on with my work refreshed afterwards. Furthermore, all of these three people deserve respectable acknowledgement for their immensely helpful comments and criticisms on an earlier draft of this dissertation. Not to be left unmentioned is also my indebtedness to my mother Barbara Klein for her continuous emotional support and her financial aid to be able to afford the recreational activities with Oliver, as well as to my dearest friend Gavin Fearnley for grammar checking my English. And finally, I would also like to express my extensive gratitude to all of my colleagues and student assistants who have contributed significantly to the completion of this project. Beyond doubt this dissertation would not have been written without this great range of professional and social support.

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1. Introduction

“Prophecy is many times the principle cause of the events foretold.”

Thomas Hobbes, philosopher (1588-1679) (source unknown)

“That is a good book, which is opened with expectation and closed with delight and profit.”

Amos Bronson Alcott, philosopher and educator (1799-1888) (source unknown)

The term self-fulfilling prophecy (SFP) designates a situation where a person's *expectation* of a particular event *causes* the actual occurrence of this event (e.g., Brophy, 1983; Eden, 1990; Jones, 1977). An expectation, in turn, can be specified as a subjective judgment regarding the likelihood of a future event to happen (Jussim, 1986; Olson, Roese & Zanna, 1996; Zuroff & Rotter, 1985). Furthermore, albeit the expecter has been defined as unwitting in terms of the causal relation between the initial expectation and the final outcome, he/she has not been described as uninvolved: Because of the expectation held, the expecter engages in a particular behaviour, ultimately leading to the confirmation of the expectation. Hence, had the expectation not been adopted in the first place, the expecter would have behaved differently and another outcome would have been brought about.

SFP effects have been demonstrated to reign over human agency across a variety of different settings: in the laboratory for experimenters and their experimental subjects (Rosenthal & Fode, 1963; Rosenthal & Lawson, 1964), in school for teachers and their students (Babad, 1993; Smith, Jussim & Eccles, 1999), at work for supervisors and their subordinates (Eden, 1993a; 1993b; McNatt, 2000), in nursing homes for carers and their patients (Learman, Avorn, Everitt & Rosenthal, 1990), in military camps for sergeants and their recruits (Eden & Shani, 1982) and in a wealth of other social encounters involving person perception and stereotyping, such as, job interviews (Miller & Turnbull, 1986; Snyder, 1984; Snyder & Stukas, 1999). This dissertation will follow in the footsteps of these investigations, assessing whether a SFP effect also

arises for students and their instructional medium in self-regulated learning¹. Next, an introduction into the phenomenon in focus will be provided (Section 1.2) and followed by a detailed overview of the individual chapters' content (Section 1.2).

1.1 The Phenomenon: Self-Fulfilling Prophecy and Quality Information About an Instructional Medium

The main research question of this dissertation is whether positive information and respective positive expectations of the students about the quality of an instructional medium (e.g., textbook, computer-based training) will lead to higher levels of students' satisfaction and achievement—or, to speak with Alcott, to students' delight and profit—than negative quality information and respective negative students' expectations. Thus, the outcome a student realises with an instructional medium will be suggested as significantly dependent on the particular information provided about the instructional medium's quality and the student's respective expectation and not on the objective quality of the instructional medium. Despite the plethora of research on SFP effects in the educational domain, the present inquiry will set foot on new empirical ground, because this issue has so far largely remained unexplored.

New theoretical ground will also be entered, since this dissertation will need to develop and validate its own model to account for this particular type of SFP effect. More specifically, the existing explanatory models for SFP effects in education would not straightforwardly predict a SFP effect on the basis of quality information about an instructional medium in self-regulated learning. In fact, and contrasting with Hobbes' causal view on

¹ When using the term self-regulated learning, it must be acknowledged that any comprehensive knowledge acquisition is best understood as taking place on a continuum from teacher- or other- (e.g., peers) to pure self-regulation (Schiefele & Pekrun, 1996). Generally the term self-regulated learning is used to refer to learning scenarios, in which students carry the main responsibility for planning, observing and regulating their individual learning behaviour—even if significant others might sometimes intervene (e.g., Boekaerts, Pintrich & Zeidner, 2000). Within the current investigation in particular, the term designates pure self-regulation phases, in which students are supported only through an instructional medium (e.g., a textbook or a web-based training).

SFP effects, their empirical evidence suggests expectations as a necessary prerequisite, but not as a sufficient condition. As will be detailed below, the sufficient conditions identified to determine SFP effects in education appear irrelevant within the context of students' self-regulated learning.

The investigation of SFP effects in the educational realm was sparked off by Rosenthal and Jacobson's (1968) study on the effect of teachers' expectations, coined the Pygmalion effect. They claimed that their results established that providing teachers with positive information about some of their students' future IQ development promoted these students' actual later IQ performance. In the following decades, the inquiry into SFP effects in teacher-student interaction evolved into a core educational research field (Blanck, 1993; Brophy & Good, 1974; Dusek, 1985). Within this comprehensive endeavour an important discovery was made. Expectations held by the individual students—the one and only protagonists within the context of self-regulated learning—could produce SFP effects, too. First, positive information given to students about their own achievement-related competence was shown to result in an achievement elevation (e.g., Zanna et al., 1975). Second, and of highest importance for the present inquiry, a phenomenon appearing very similar to the one under investigation was demonstrated: Giving students' positive information about their teacher's instructional competence also brought about a significant increase in those students' academic achievements, as well as their satisfaction ratings of the teacher and the lecture compared to respective negative information (e.g., Feldman & Prohaska, 1979).

Now, the explanation elaborated subsequently to explain this latter SFP effect, as well as the various other SFP effects discovered in the classroom, centred on interpersonal behavioural changes between the teacher and the student as significant underlying mediators (e.g., Brophy & Good, 1974; Feldman & Prohaska, 1979; Jussim, 1986). But such processes cannot form the primary explanatory basis for self-regulated learning outcomes, where no interpersonal interaction occurs during learning. Rather, in this setting, the mediating factors must be intrapersonal

changes, happening within the individual student. The interpersonal explanatory focus of SFP research in education may be one possible reason why the effect of expectations about the quality of instructional media still represents a largely neglected issue.

Research focusing on self-regulated learning, however, has at least confirmed the importance of students' self-oriented expectations (i.e., self-efficacy expectations) for their achievement outcomes (e.g., Bouffard-Bouchard, Parent & Larivee, 1991; Pajares & Johnson, 1996; Zimmerman & Bandura, 1994). But so far these findings have not been classified as SFP effects. Besides, these studies have identified a whole range of intrapersonal mediating pathways (e.g., students' cognitive, metacognitive, volitional or behavioural strategies) involved in the effect of students' self-efficacy expectations. Whether one of these mediating pathways is also differentially activated by varying quality information about the instructional medium to be used for students' self-regulated learning is still an unanswered question.

Irrespective of these gaps within scientific inquiry, in practice students' self-regulated learning with an instructional medium is often accompanied by third party recommendations about the quality of this medium. For example, lecturers provide their students at times with quality information about the relevant books available in the university library or mention that the computer-based training to be used has already received a best-practice award. Also students amongst themselves frequently share their views on textbooks and other basic readings or on computer- and web-based instructional media to be used within their courses. The everyday significance of other's recommendations about instructional media is also well illustrated by the popular Internet bookseller amazon.com on their websites; amongst other product information (e.g., prizes or publisher's content descriptions) customers' product recommendations are provided. The following examples, involving two popular psychology textbooks, show that such quality information can be both positive and negative (see Figure 1.1 and Figure 2.2).

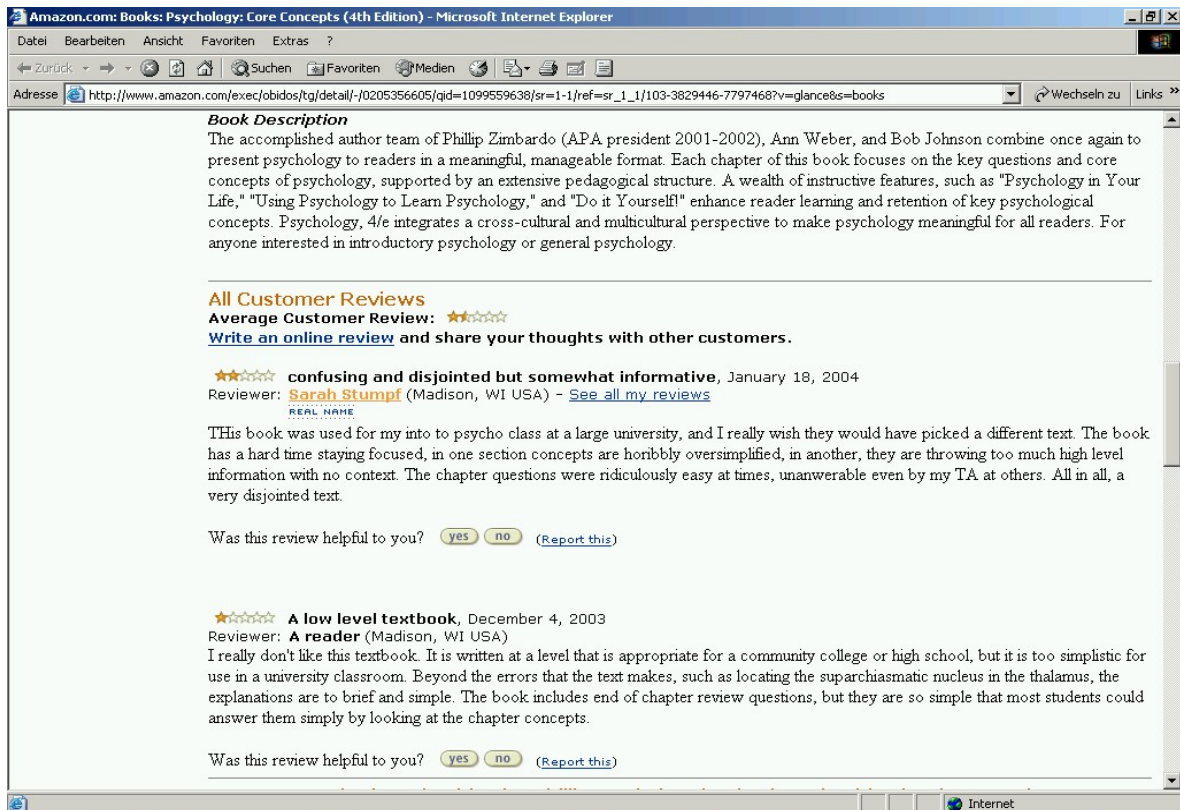


Figure 1.1

Customer reviews of a psychology textbook by Zimbardo, Weber and Johnson (2003) at amazon.com

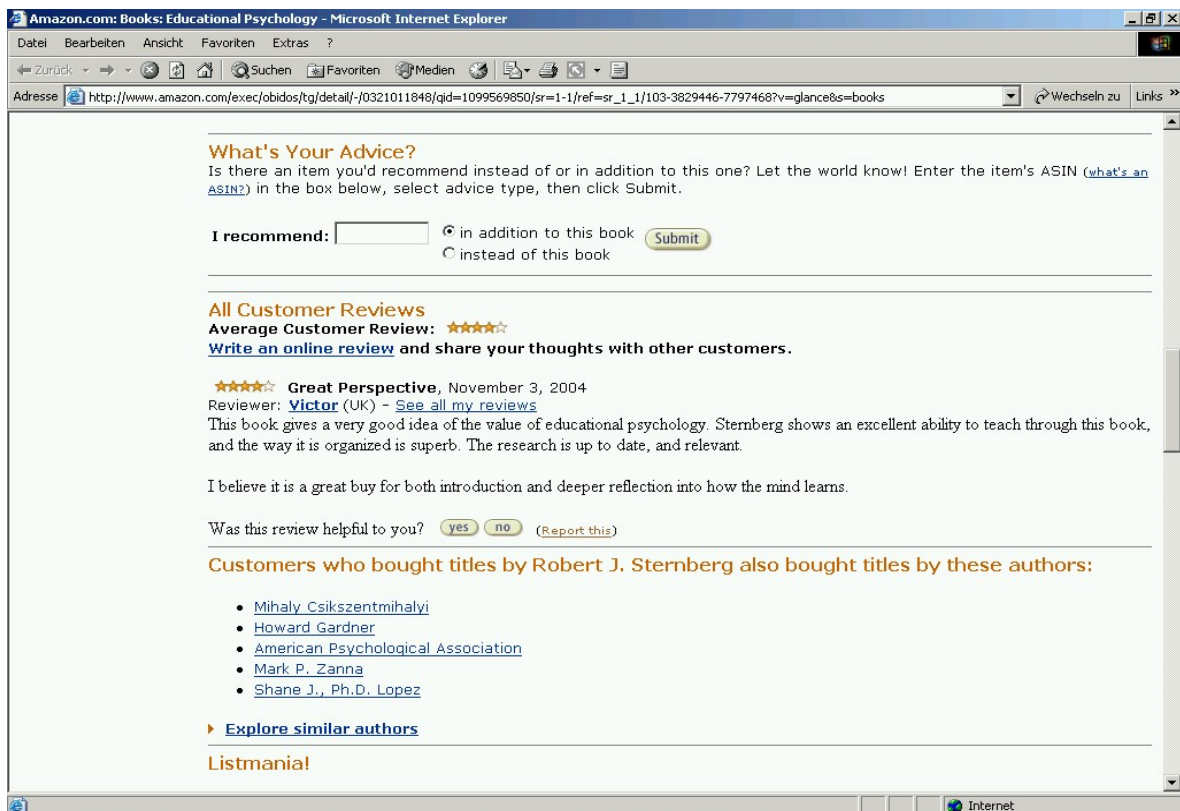


Figure 1.2

Customer review of a psychology textbook by Sternberg and Williams (2002) at amazon.com

Research on consumer judgment suggests the occurrence of SFP effects on the basis of such quality information. Various studies have established that word-of-mouth recommendations can affect people's pre-usage expectations about a product's quality (Burnkrant & Cousineau, 1975; Cohen & Golden, 1972; Herr, Kardes & Kim, 1991; Laczniak, DeCarlo & Ramaswami, 2001; Pincus & Waters, 1977; Smith & Vogt, 1995). A study by Fitzgerald Bone (1995) also confirmed the influence of word-of-mouth recommendations on product judgments after the actual use of the product: Positive recommendations led to more positive short-term and long-term ratings of different products (i.e., chocolate chips and audio tapes) than negative recommendations².

Now imagine a psychology student using amazon.com to get hold of a book he/she is obliged to use in his/her course, let us say the Zimbardo et al. (2003) book. The negative word-of-mouth recommendations presented might result in the student rating this book more negatively even after having actually worked through it, than if he/she had not been presented with such recommendations. Furthermore, had the student received positive recommendations, his/her post-study judgment might have received a significant boost. Now for the present research endeavour the important question to ask is: Could such a SFP effect not only occur regarding the student's subjective evaluative response of the book's quality after studying (i.e., the student's satisfaction with the book), but also with regards to the student's objective achievement outcome—given, of course, that the book can be objectively judged as not totally deficient in quality?

² It is important to mention that this outcome variable is subjective in nature. Some controversy exists as to whether SFP effects should only be recognised as such, if the outcome can be judged as being affected *objectively* in terms of individuals' behaviours, or whether they exist already, if a change in outcome is apparent on the level of individuals' *subjective* perceptions (Darley & Fazio, 1980; Darley & Gross, 1983; Ludwig, 1991; Rosenthal & Jacobson, 1968). In view of this debate, the present work will pay particular attention to separate subjective (i.e., students' satisfaction with an instructional medium) and objective outcomes (i.e., students' performance in an achievement test) of students' self-regulated learning.

An empirically validated answer concerning this question seems especially of high relevance given the increasing importance of self-regulated learning scenarios across institutional and non-institutional contexts (e.g., Boekaerts, 1997; Zimmerman, 2002). To provide a practical example, students at the University of Mannheim are faced with various new self-regulated learning challenges, such as, using computer-based trainings as a supplement to traditional tutorials (e.g., Kranich & Schmitz, 2003) or accessing whole lecture series digitalised, at home on their personal computers (see for example the website of the Department of Applied Computer Science IV at <http://www.informatik.uni-mannheim.de/pi4/lectures> or the website of the Department of Educational Science II at <http://www.ew2.uni-mannheim.de/pp/ss05>). Besides, self-regulated learners across all contexts increasingly make use of the flood of instructional media provided on the Internet (Guinee, Eagleton & Hall, 2003; Hill, 1999; Hill & Hannafin, 1997; Rogers & Swan, 2004; Wolfe, 2000).

Whilst focusing on the phenomenon of SFP effects, the present research project might also be understood as an inquiry into the impact of external conditions on students' self-regulated learning. Research on self-regulated learning has so far preponderated on identifying students' cognitive, metacognitive, motivational or behavioural strategies to promote successful learning outcomes, as well as on the individual student characteristics moderating the application of these strategies (e.g., Boekaerts, Pintrich & Zeidner, 2000; Zimmerman, 1990a, 1990b). Hence, few studies have concerned themselves with the role of situational variables³, despite the fact that these sometimes might more readily lend themselves to instructional modification. An educational intervention using SFP effects triggered by quality information about an instructional

³ For exceptions see Hadwin et al. (2001), who have investigated the effect of varying study contexts (i.e., reading to learn about a topic, studying for an examination and writing an essay) on students' self-regulated learning strategies and Wood, Bandura and Bailey (1990), who have demonstrated the effect of different instructions concerning task-specific goals on both the process and the outcome of students' self-regulated learning.

media to be used could certainly profit from a comprehensive and theory-driven understanding of the mechanisms involved in the production of such effects.

To arrive at specific predictions regarding how and under which conditions the effect of quality information about an instructional medium will occur, an additional theoretical framework is going to be consulted: research on attitude formation. Here, the following comparable issue has been intensively investigated. *Why are attitude-relevant information sources (e.g., politicians or newspapers) sometimes more successful in persuading others into their attitudinal standpoint, if they are perceived as experts on the topic concerned?* On the basis of a broad range of empirical results, a comprehensive model—the Elaboration Likelihood Model (ELM)—has been developed to explain the effect of an information source’s competence on persuasion together with the important mediating and moderating factors⁴ (e.g., Petty & Cacioppo, 1986a; 1986b; Petty & Wegener, 1999). The ELM pinpoints cognitive processing differences as the important mediating variable for the effect of information about a source’s competence on attitude formation. According to the ELM, if an information source is perceived as highly competent for the subject matter concerned, the recipient of a persuasive message will, given specific moderating conditions, process the message content with more effort and in more detail than if the information source is perceived to be low in competence. Ultimately, this will affect the outcome of the persuasion attempt. One of the most important moderating factors defined by the ELM to let such a source effect arise is the relevance of the message content to the message recipient.

These two assumptions can be adapted to explain the occurrence of a SFP effect generated by quality information about an instructional medium on

⁴ It must be noted that the ELM does not generally deal with the occurrence of SFP effects, but nevertheless—as will be suggested within the current investigation (see Chapter 4 and Chapter 5)—appears to be able to explain such an effect in the particular case of information given to students about an instructional medium’s quality.

students' self-regulated learning outcomes. Thus, they represent two essential features of the explanatory model ultimately established. In short, this model will postulate that if an instructional medium is expected to be high in quality, students will process its content in a deeper, more effortful manner than if the instructional medium's quality is expected to be low. These cognitive processing differences will affect students' final learning outcomes. Furthermore, the model will suggest that the prevalence of this mediating pathway depends on the particular level of relevance of the learning content to the individual student. Of course the application of the ELM's predictions to the phenomenon in focus will not be executed without a thorough discussion of the theoretical constructs involved and their transferability from the context of attitude formation to the area of knowledge acquisition. Besides, the final model will be put to an empirical test through a series of experiments.

1.2 Overview of the Chapters

To recapitulate, this dissertation will set out to investigate whether quality information about an instructional medium can trigger a SFP effect with respect to students' objective and subjective self-regulated learning outcomes (i.e., achievement and satisfaction with the medium, respectively). This main objective of the present inquiry further encompasses the theoretical elaboration of a comprehensive model explaining the moderating and mediating conditions to generate this effect and the empirical testing of this model. To set out how these targets are going to be reached, an overview of the individual chapters follows.

Broadly speaking, this dissertation is divided up into three main parts. Part I discusses the implications of psychological research on SFP effects within the context of education in regards to SFP effects generated by quality information about an instructional medium in self-regulated learning. Part II presents psychological research within the context of attitude formation and its application to quality information effects.

Finally, Part III is concerned with the empirical testing of the model developed on the basis of these two lines of research.

More specifically, Part I will give a detailed outline of this dissertation's primary theoretical background: SFP effects in teacher-regulated learning (Chapter 2). Here, the focus will be on empirical evidence for the effect of teachers' expectations about their students' competence (Section 2.1), the effect of students' expectations about their own competence (Section 2.2.1) and, most importantly, the effect appearing most closely related to the phenomenon under investigation: the effect of students' expectations about their teacher's competence (Section 2.2.2). Furthermore, the various models proposed to specify the mediating and moderating processes involved in these different SFP effects will be reviewed in search of an intrapersonal mediating pathway (Section 2.3). As already mentioned, the focus on interpersonal explanations will be pinpointed as the dominant characteristic of all of the existing models. Hence, the question is going to be raised whether SFP effects can occur at all within self-regulated learning, where the explanatory focus must lie on students' intrapersonal processes.

The second theoretical framework presented in Chapter 3—SFP effects in self-regulated learning—will provide some vital evidence that a positive answer can be given to this question. Here, theoretical and empirical works dealing with the influence of students' self-oriented expectations (i.e., self-efficacy expectations) on their self-regulated learning outcomes will be introduced and taken as support for SFP effects in self-regulated learning (Section 3.1). Thereby, various intrapersonal pathways for the effect of students' self-efficacy expectations on their learning outcomes will also be identified. In the light of this research, the first empirical evidence for the impact of expectations about an instructional medium's quality on students' self-regulated learning outcomes will finally be introduced together with the preliminary intrapersonal explanations given for the mediation of such effects (Section 3.2). After having outlined how these different explanations can be integrated into one coherent structure,

Chapter 3 will close with a discussion of the link between this preliminary intrapersonal explanation and the interpersonal explanations of SFP effects in teacher-regulated learning, which were detailed in Section 1.3 (Section 3.3).

Part II will proceed with the third and final significant theoretical framework—research on attitude formation—to further specify the preliminary intrapersonal explanation given for the occurrence of a quality information effect in self-regulated learning. After a detailed description of the predictions stated by one of the most dominant models in this area (i.e., the ELM), these predictions will be suggested as being applicable to the current research issue (Chapter 4). Moreover, the soundness of transforming the ELM into a model of the effect of quality information will be ensured with a comparison of the theoretical constructs discussed within the ELM and the ones pinpointed within the preliminary intrapersonal explanation of the quality information effect (Chapter 5). Within this comparative discussion, research from other areas of educational psychology will also be consulted where necessary. This will result in various vital adaptations and extensions of both the preliminary explanation and the ELM-derived predictions and, ultimately, in the final intrapersonal model of the effect of information about an instructional medium's quality on students' self-regulated learning outcomes: the Quality Information Impact Model (QIIM).

In Part III a series of experiments will be presented, testing the QIIM's hypotheses about the moderating conditions of the quality information effect in self-regulated learning and the mediating processes involved. The first experiment will explore the effect of quality information about an instructional medium on students' quality expectations and the dependence of this effect on two situational moderating factors: specific characteristics of the person giving the quality information (i.e., suggested level of competence), as well as implicit quality information about the instructional medium (i.e., suggested competence of the author of the instructional medium) (Chapter 6). The second experiment will investigate

the quality information effect on students' self-regulated learning outcomes (i.e., achievement and satisfaction) under one particular moderating condition supposed to facilitate its occurrence: moderate relevance of the learning content to the students (Chapter 7). Moreover, students' quality expectations will be investigated in terms of their mediating function for this effect. The third experiment will extend Experiment 2 by varying the level of the moderating student factor content relevance (Chapter 8). In the fourth experiment, the influence of the situational moderator *cue giver competence* on the quality information effect will be investigated, in addition to the individual moderator *content relevance* (Chapter 9). The mediators assessed will be students' quality expectations, as well as their learning strategies and cognitive effort investment into learning.

Each of the four experiments will be individually described in its methods and separately discussed in terms of its results. The last chapter (Chapter 10) will offer a summarizing overview of the experimental results and discuss their implications for the explanatory model, for the various theoretical backgrounds underlying this model and for everyday instructional practice.

PART I: SELF-FULFILLING PROPHECY IN EDUCATION

The term SFP originated from the sociologist Robert Merton, 1910-2003, and his widely known theoretical explanations of various serious societal and economical problems of his time (cf., Merton, 1949). One of Merton's classic examples of a SFP effect concerned the sudden bankruptcy of a wealthy bank, caused by negative information about the bank's future prosperity. Due to this information, the clients started taking out their money, which finally caused the bank's insolvency. Similar to the phenomenon under investigation, in Merton's example the significant expectations induced did not concern another human agent. Nonetheless, within the empirically oriented literature, the term SFP has been used predominantly to designate expectancy effects in interpersonal interaction (e.g., Blanck, 1993; Jussim, 1986).

The psychologist Robert Rosenthal pioneered the empirical research arena on SFP effects. After having generated the very first empirical evidence for SFP effects in the context of the scientific laboratory (Rosenthal & Fode, 1963; Rosenthal & Lawson, 1964), Rosenthal—together with his co-worker Eleanor Jacobson—also was first in empirically validating SFP effects in the educational realm (Rosenthal & Jacobson, 1968). Their results suggested that teachers' expectations about their students' influenced their students' later performance, with high expectations exerting a beneficial effect compared to no expectations. These authors christened the SFP phenomenon in the classroom the Pygmalion effect. This name referred to George Bernard Shaw's classical theatre play "Pygmalion", in which the female lead's behaviour is shown to vary dependent on her two male counterparts' individual expectations. Shaw himself had borrowed his title from ancient Greek mythology (cf., Bulfinch, 1964), telling the story of the sculptor Pygmalion, who had fallen in love with his statue, built according to his ideal expectations and named Galatea. Because of the great intensity of Pygmalion's love for Galatea, in the end the Greek

gods felt impelled to awaken her to life and allow them to engage in human interaction.

The last five decades have witnessed an enormous number of empirical investigations into SFP effects in the classroom and other settings (see Blanck, 1993; Brophy & Good, 1974; Dusek, 1985 for detailed overviews), whereby the term Pygmalion effect has often been used as a synonym for SFP effect. In one of his recent updating publications, Rosenthal himself reported the impressive number of 479 replication studies on this research matter (Rosenthal, 2002). To gain a more thorough understanding of the phenomenon of SFP effects, Chapter 2 will review the relevant research available in the domain of teacher-regulated learning.

2. Expectancy Effects in Teacher-Regulated Learning

The review of SFP effects in teacher-regulated learning will start with an outline of the classic Pygmalion effect: the effect of teachers' expectations about their students' performance on students' actual performance (Section 2.1). Next, the focus will turn to the effect of students' expectations about their own and their teachers' performance (Section 2.2), as well as to the explanatory accounts put forward to explain these various expectancy effects (Section 2.3). The results presented about students' expectations are particularly important, since in the present instructional scenario the student is the only potential agent, who might trigger a SFP effect. Thus, research on the effect of students' expectations in teacher-regulated learning might be useful in putting forward an explanation for the generation of SFP effects in self-regulated learning on the basis of quality information about the instructional medium to be used. Whether this is indeed the case will be evaluated in the final section of this chapter (Section 2.4).

2.1 Teacher Expectations: The Classic Pygmalion Effect

The landmark study by Rosenthal and Jacobson (1968) on the effect of teachers' expectations provoked a lot of controversy. At the same time, however, it also inspired a wide range of other researchers to follow up on the generated results. In the following, the original findings, the criticism brought against them and the current status quo on the issue will be specified.

2.1.1 Rosenthal and Jacobson's (1968) Landmark Study

In a nutshell, Rosenthal and Jacobson (1968) put forward the following findings: Priming teachers with information about the intellectual progress of particular students produced a significant intellectual gain in the respective students. The experimental procedure taken by the authors was as follows. At the beginning of the school year, students of grades one

through six of an US primary school were tested on a nonverbal intelligence scale, the *Test of General Ability* (TOGA). However, their teachers were led to believe that the test would measure the students' future intellectual potential, allegedly being called the *Harvard Test of Inflected Acquisition* (HTIA). The claimed study purpose was the final test of the HTIA's psychometric qualities. Supplying teachers with the names of certain students demonstrating particularly high HTIA scores thus represented an index for teachers of these students' future intellectual performance. But not only were the teachers led astray about what the test aimed to measure, also the naming of the high potentials occurred randomly and did not reflect these students' actual TOGA scores. Nevertheless, readministration of the TOGA eight months later revealed a significant increment in the nonverbal intelligence of the suggested high potentials in comparison to their classmates.

Rosenthal and Jacobson's demonstration of what they termed Pygmalion effect aroused a lot of societal attention, implying serious issues about students' equal opportunities. As Spitz (1999, pp. 201-226) notes, their study "...was not simply a scholarly exercise; it contributed to public policy deliberations and educational decisions...within an academic and societal climate dominated by radical environmentalism.". The following decades have seen a vigorous argument concerning Rosenthal and Jacobson's bold claim of students' intelligence being affected by their teachers' expectations, with the hot debate around the socio-political consequences lasting into the current century (Good & Nichols, 2001).

The focal points of attack were on the following methodological shortcomings (Elashoff & Snow, 1971; Jensen, 1969; Snow, 1969; Snow, 1995; Spitz, 1999; Thorndike, 1968). First, the study was denounced, because the TOGA was administered on a group and not on an individual level. This procedure was considered to have been more prone to create experimental artefacts. In line with this view, the TOGA scores showed great fluctuations and improbable low scores for one student subsample. Furthermore, the finding of teacher expectancy effects was run down,

because of (1) the inability of most of the teachers to remember the names of the students claimed to be high potentials, (2) the test administration by the teachers themselves instead of experimenters blind to the study's purpose, (3) the use of the individual rather than the classroom as the unit of analysis when comparing experimental and control group, (4) the pre-test/post-test measurement procedure, supposedly leading to practice effects and (5) the false extrapolation of scores. Last but not least, the summation of results and, thus, the claim that the entire experimental group outdid the control group came in for additional censure. Doing so was demonstrated to cover up the fact that the effect was only dominant within some particular subgroups: namely, the first and second graders. But Rosenthal along with his followers judged these criticisms neither as serious enough to discard the reported results nor the implications deduced from them (Rosenthal & Rubin, 1971; 1978; Rosenthal, 1985; 1991; 1994; 2002).

2.1.2 Research Following Up on Rosenthal and Jacobson's (1968) Findings

The various criticisms of the first Pygmalion study were taken by Rosenthal and other researchers as a challenge to generate further empirical evidence, backing up the existence of the phenomenon in the classroom, as well as in various other social domains of human agency (for comprehensive overviews see Dusek, 1985 and Blanck, 1993, respectively). Overall, within ten years of the first published article on the Pygmalion effect in the classroom, a total of 345 studies on expectancy effects across different domains had emerged (Rosenthal & Rubin, 1978). Depending on the area of research, the size of the mean expectancy effect varied from Cohen's d of 0.14 (reaction time tasks) to 1.73 (animal learning tasks), the mean expectancy effect size of studies using learning and ability tasks amounting to 0.54 and of the total studies to 0.70. Later updates of these results recounted similar effect sizes. Hence, ample evidence of the practical importance of the effect of expectations for human social reality exists (Rosenthal, 1985; 1994; 2002).

Regarding the phenomenon of teacher expectation effects in particular, the studies following up on Rosenthal and Jacobson's (1968) results also were able to show a significant influence of teachers' naturally pre-existing expectations about their students' potential on students' final outcomes (e.g., Brophy & Good, 1970; Good, Cooper & Blakey, 1980; Rist, 1970; Kuklinski & Weinstein, 2001). Thereby, the outcome variables in focus also included a whole range of other variables besides students' intelligence (e.g., students' academic achievement or students' self-oriented cognitions). Furthermore, meta-analytical and review papers concentrating on teacher expectancy effects established that claims for the existence of these effects can be safely made only for students' achievement as well as teachers' and students' classroom behaviour; but not for students' intelligence (Baker & Christ, 1971; Smith, 1980).

Another critical issue, raised by researchers specifically dealing with teacher expectancy effects, concerned the accuracy of teachers' naturally existing expectations (e.g., Brophy, 1983; 1985; Dusek & O'Connell, 1973; Jussim, 1991). In short, the thrust of empirical studies on these SFP effects had attempted to differentiate the effect of teachers' expectations about their students from the real characteristics of these students through the use of random variation of the specific information given to the teachers about the students. Because of the use of randomisation, these studies were able to advocate the causal power of expectations on later outcomes. However, as the critics claimed, this experimental procedure had "only" demonstrated the effect of incorrect expectations. Of course this finding was indeed in line with Merton's (1949) original notion of SFP effects (see p. 13). Still, the usefulness of these experimental studies was questioned, because it was argued that teachers in real life would simply not develop wrong expectations about their students. Rather, teachers' expectations were asserted to be by and large correct, because they were based on some valid and objective "reality criterion" (e.g., students' past achievement scores in standardised tests) and, thus, would hold predictive validity (as it appeared in naturalistic studies).

Hence, experimental approaches could not completely eliminate the question of causal directionality: Do teachers' expectancies really cause students' behaviour, or do teachers' expectancies predict students' behaviour simply because they are influenced by students' prior behavioural histories?

But a recent field study by Alvidrez and Weinstein (1999) demonstrated that teachers base their expectations not only on valid and objective background information (i.e., students' IQ performance), but also on less valid information (e.g., students' socio-economic status). Furthermore, an early experimental study by Cooper (1979a) established that teachers do not necessarily weight their expectations according to the reliability of the information about student ability (i.e., standardised tests, previous teacher, family background and physical characteristics); although they clearly seemed to be aware of the reliability differences between the varied types of information. This means that teachers' student-oriented expectations must not always be considered accurate in the sense of being generated on some objective "reality criterion". Further field studies showed that teacher expectations predicted students' performance, even if relevant "reality criteria" (e.g., previous achievement) were statistically controlled (Brattesani et al., 1984; Jussim, 1989; Jussim & Eccles, 1992; Kuklinski & Weinstein, 2001; Smith, Jussim & Eccles, 1999). Admittedly, in these studies the SFP impact of teachers' expectations was somewhat reduced.

Altogether, the current state of research can be understood as representing a consensus position, acknowledging the co-existence of two causal pathways. On the one hand, teachers' expectations are affected by students' achievement and, thus, teachers' expectations must be taken as accurate to some degree. On the other hand, students' achievement is also influenced by teachers' expectations beyond prior objective achievement and, therefore, teachers' expectations initiate SFP effects to a certain extent.

In the outlined research on expectancy effects in teacher-student interaction the primary focus was on the teacher. The student's role was on the whole overlooked. For the present undertaking, the student is particularly important since, in the context of self-regulated learning, he/she will be the only agent available during the course of learning. Consequently, the student represents the centre stage for permitting expectancy effects and their mediating processes to occur. Next, research will be presented that sheds more light on the importance of students' expectations within SFP effects in teacher-regulated learning.

2.2 Student Expectations: Galatea and Pygmalion Effects

"The students under investigation have been treated like the original Galatea, i.e., devoid of any expectancies of their own."

Zanna et al. (1975, p. 280)

Studies investigating the effect of students' expectations centred on two different types of expectations: first, students' own expectations about their individual performance potential and, second, students' expectations about the instructional competence of their teacher. The SFP effects generated by these different expectancies will be discussed in detail forthwith.

2.2.1 Students' Expectations of Their Own Performance: Galatea Effects

Supporting the importance of their statement in the above quote, Zanna et al. (1975) were able to show that students' self-oriented expectations affected students' academic performance within a seven weeks summer enrichment programme. At the beginning of the programme bogus test scores indicating high student performance potential were used to induce positive expectations in half of the students. Positive expectation induction caused a significant increase of the respective students' end results in the two subject matters taught (i.e., Mathematics and English) compared to a control group for which no expectations had been induced. Referring again

to the ancient Greek myth of the sculptor Pygmalion and his statue Galatea, the authors termed this effect the Galatea effect.

Other studies (Meichenbaum & Smart, 1971; Rappaport & Rappaport, 1975) produced similar evidence for the effect of students' self-oriented expectations. Meichenbaum and Smart (1971) illustrated in their study that engineering students profited in their later academic performance and motivation (e.g., self-confidence or interest in course material) from direct induction of positive self-oriented expectations. Likewise, Rappaport and Rappaport (1975) established a significant benefit in reading achievement within a compensatory programme for students, who had again initially received positive expectancy-inducing information about their particular performance potential. Again both of these studies used control groups with no expectations induced as their baseline for comparison.

2.2.2 Students' Expectations of Their Teacher's Performance: Pygmalion Effects

Besides effects of students' expectations about their own potential, other studies demonstrated an effect closely related to the phenomenon in focus. These studies revealed students' expectations about their teacher's instructional competence as significant determinant of their own learning outcomes. For example, a study conducted by Feldman and Prohaska (1979) suggested that students' expectations of their teacher's competence influenced a whole range of students' classroom behaviours. The experimental procedure required two groups of students to attend a practice lecture of an ostensible third year education student, after having randomly received either positive or negative information about the young teacher's competence. During the lecture the students' nonverbal behaviour (i.e., forward lean towards teacher, eye contact, directness of orientation and interaction distance) and after the lecture their attitude about the teacher and the lecture as well as their achievement were assessed. Significant group differences appeared for all of these aspects:

Compared to negative expectations, positive expectations resulted in more positive nonverbal behaviour, more positive teacher and lecture ratings as well as increased achievement of the students.

A follow-up experiment, also reported by Feldman and Prohaska (1979), suggested that the different nonverbal behaviour exhibited by the students in the first study might have essentially affected the teacher. This study used a role-playing method, participants acting either as teachers or students. Teachers who were exposed to positive nonverbal behaviour from their students exhibited more positive self-related attitudes (e.g., feeling more pleased with their teaching performance) and more adequate instructional behaviour (as indicated by two observers' ratings) than teachers who were confronted with negative nonverbal student behaviour. Feldman and his co-workers thus concluded that students' teacher-oriented expectations had exerted their differential impact on their own achievement in the first study, because these expectations made them behave differently towards the teacher. In turn, this led the teacher to engage in different teaching behaviours, ultimately influencing the students' outcomes. Later studies by Feldman and his co-workers (Feldman & Theiss, 1982; Feldman et al., 1983) provided further evidence that students' teacher-oriented expectations impact on student and teacher classroom-related outcomes.

Taking different experimental slants, other researchers were also able to empirically validate the demonstrated effect of students' expectations about their teacher's competence on students' outcomes (Jamieson et al., 1987; Leventhal, Perry & Abrami, 1977). The study by Jamieson et al. (1987) found evidence of this phenomenon in a more naturalistic setting. They used the transfer of a female teacher to a new school to provide her students randomly either with positive or no particular information about her competence at the very beginning of her first English teaching unit. Students for whom positive expectations about the teacher's competence had been elicited displayed again more adaptive nonverbal behaviours (e.g., they paid more attention and showed less gross motor responses)

during the teaching lessons and superior overall academic achievement at the end of the unit compared to their fellow students, who had no such expectations induced. It is interesting to note that Jamieson and his co-workers also did not identify any initial differences in terms of students' prior knowledge (i.e., grade point averages in English) between the experimental and the control group. Furthermore, these authors also discussed an alternative mediational pathway in addition to the teacher-focused explanation provided earlier by Feldman and Prohaska (1979): Rather than the teacher's differential instructional behaviour, students' positive expectations might have raised their own performance via an increase of their own motivational state. However, no data was provided to test either of these process-oriented explanations.

Some empirical support that teachers' differential instructional behaviour may not necessarily be involved in the generation of the effect caused by students' teacher-oriented expectations has been supplied with a study conducted by Leventhal et al. (1977). Here, all students attended a 20-minute videotaped lecture by a teacher about whom they had received varying competence information (positive vs. negative). Again evidence was found in support of the effect of students' expectations about their teacher's competence on both students' achievement and students' post-lecture ratings of the teacher. Yet these effects seemed to depend on an additional moderating variable, which the authors designated as lecture quality. Positive teacher competence information showed the beneficial effect on achievement in comparison to negative teacher competence information only under poor and not good lecture quality. Conversely, positive information about the teacher's competence resulted in higher ratings compared to respective negative information only given good but not poor lecture quality. Unfortunately, no explanation was given by the authors for this complex interaction.

Generating such an explanation indeed is made very difficult by Leventhal et al.'s (1977) ambiguous operationalisation of the moderating factor. As

such, the authors provided only the following brief description of their manipulation:

“The two lectures, “good” and “poor”, were delivered by the same instructor who discussed the same amount of material on the same subject: research design in psychology. The lectures differed in fluency, amount of stammering, organization, use of blackboard, enthusiasm, voice dynamics and apparent familiarity with the lecture material.” (Leventhal et al., 1977, p. 364).

Thus, it is not at all made transparent (1) in what way these various aspects varied between the two different conditions and (2) how they might have resulted in the different moderating effect on the influence of teacher competence information on the two outcome factors. Moreover, many of the manipulated aspects might not be readily classified as making up either a good or a poor quality lecture. For example, an enthusiastic presentation might be appropriate only for specific topics, whereas for others a sober presentation style might be more applicable. Similarly, intense use of the blackboard does not guarantee a good quality lecture, depending, as it does, on a clear arrangement of the things put down and not losing eye contact with the students.

Despite the lack of an appropriate explanation for the pinpointed interaction effect and the ambiguous operationalisation of the moderator, Leventhal and his co-workers' (1977) findings are highly significant for several reasons. First, the fact that the experimental setting involved only video-based material supports the assumption that SFP effects in the classroom triggered by students' expectations can also occur on the basis of an intrapersonal mediational pathway, taking exclusively place within the student. Second, their results have highlighted the importance of considering potential moderators when investigating the effect of students' expectations about their teacher's competence. Finally, the different moderated effects of students' teacher-oriented expectations on their achievement and their teacher ratings suggested that the mediating processes involved in these effects are essentially different.

2.2.3 Summary

Recapitulating, similar to teachers' expectations, students' expectations have been verified to trigger SFP effects. Besides the demonstration of SFP effects on the basis of students' expectations about their own competence, most remarkable for the present inquiry is that ample evidence exists that students' expectations about their teacher's instructional competence do also exert SFP effects. Providing students with positive—compared to negative or no—information about their teachers' competence resulted in more appropriate instructional behaviour from the teachers and more positive attitudes stated by the teachers about their own teaching performance; the students themselves also generated more positive attitudes about the teacher, displayed more appropriate nonverbal classroom behaviour and, most importantly of all, reached higher achievement levels. In contrast to the effect of teachers' expectations about their students' competence and the effect of students' expectations about their own competence, this effect of students' expectations about their teacher's competence seems very similar to the phenomenon in focus of this research endeavour. Put more precisely, just as expectations about the teacher's competence occupy an essential function for students' learning outcomes in teacher-regulated learning, the expectations of students' about the quality of an instructional medium might be crucial for students' outcomes in self-regulated learning.

However, the only empirically validated explanation put forward for the effect of students' expectations about their teacher's competence suggested that this kind of SFP effect is vitally fed by interpersonal interaction—most importantly teachers' differential instructional behaviour, elicited by students' differential nonverbal behaviour. Yet the study by Leventhal et al. (1977) provided evidence that an effect of students' teacher-oriented expectations can also arise when the teacher appeared only on video and could not have instructed the students' differentially. Thus, this study might be considered *as the first empirical evidence* that SFP effects in education can also occur via intrapersonal

student variables and in this way also supports the assumption that SFP effects can be generated by quality information about an instructional medium in self-regulated learning. Jamieson et al. (1987) have already speculated about an intrapersonal mediating pathway for the effect of students' expectations about their teacher's competence via changes in students' motivational states, yet so far no empirical evidence on such a pathway exists regarding the effect of students' teacher-oriented expectations. A closer look at the explanatory approaches to the other expectancy effects identified to take place in teacher-student interaction might help to specify such an intrapersonal mediational pathway. This possibility will be explored in the subsequent section.

2.3 Explaining Expectancy Effects in Teacher-Student Interaction

After enough empirical evidence had been accumulated to claim the existence of expectancy effects in the classroom, researchers turned their attention towards the identification of the significant moderating conditions and mediating processes involved in the generation of different SFP effects. The results of these inquiries—namely teacher-focused and student-focused explanations of expectancy effects in teacher-student interaction—will be outlined in the following.

2.3.1 Teacher-Focused Explanations

One of the first, and still dominant, mediation explanations of teachers' student-oriented expectations in particular, was explicated by Rosenthal in his Four-Factor Theory (Rosenthal, 1981; 1994). However, as will become clear after a brief description of Rosenthal's account, the wealth of subsequent related evidence produced informs some vital adaptations and extensions of this theory.

2.3.1.1 Rosenthal's (1981) Four-Factor Theory

Rosenthal's (1981) Four-Factor Theory centred on interpersonal interaction between teacher and student, with a particular emphasis on

the behaviour of the teacher. Reviewing the existing relevant studies, four expectancy-related instructional behaviours of the teacher were differentiated as significant mediators for the effects of teachers' student-oriented expectancies. Positive, as opposed to negative, expectations were associated with a warmer *socio-emotional climate* created by the teacher within the classroom, as well as with more *instructional input*, *opportunities for student response* and *performance-related feedback* given by the teacher. In turn, this beneficial differential treatment was supposed to bring about the increased classroom-related outcomes of the high-expectation students in comparison with the low-expectation students.

Later meta-analytical investigations revealed the two first factors—climate and input—as the most substantial contributors to students' outcomes, although the two remaining factors also received some significant support (Harris & Rosenthal, 1985; 1986; Rosenthal, 2003). Consequently, Rosenthal (1993; Harris, 1993) renamed his theory the affect-effort theory of teacher expectancy effects and later summarised its gist as follows: “Teachers appear to teach more and teach it more warmly to students of whom they have more favourable expectations.” (Rosenthal, 1994, p. 178).

2.3.1.2 Extensions of Rosenthal's (1981) Four-Factor Theory

Studies conducted by Babad and her associates (Babad, 1979; Babad & Inbar, 1981; Babad, Inbar & Rosenthal, 1982a; Babad, Inbar & Rosenthal, 1982b), however, revealed that not all teachers seemed to be prone to trigger the chain of events outlined in Rosenthal's (1981) Four-Factor Theory. Their results emphasised that teachers' individual personalities exerted an important moderating function. Due to certain personality specificities, some teachers developed expectations about their students' performance potential on the basis of less reliable student characteristics (e.g., social class and ethnicity), which in turn was shown to affect their later instructional behaviour.

Various other studies within the educational realm, as well as other domains, have established a wide range of general social characteristics (e.g., physical appearance, social class or race) as sufficient to bring about interpersonal expectancy effects irrespective of the expecter's personality (see Rist, 1970 for one of the earliest studies; for later meta-analytical reviews see Baron, Tom & Cooper, 1985; Dusek & Joseph, 1983). But as Jussim (1986) has stressed, such stereotype-based SFP effects might only be present in the initial stages of the teacher-student relationship and might become eliminated over time, therefore showing only a medium effect size in natural settings. The results of a meta-analytical study by Raudenbush (1984) lent Jussim's argument support, showing the duration of the teacher-student acquaintance as a significant situational moderator. The longer teachers and students had known each other, the less strong was the effect of the induced teacher expectation on the students' outcome. Nevertheless, as mentioned previously (see Section 2.3.1.2), evidence exists that teachers' built their expectations concerning their students' ability also in real life to some extent on social categories such as students' socio-economic background (Alvidrez & Weinstein, 1999). Furthermore, as the outlined work by Babad and her co-workers suggested (Babad, 1979; Babad & Inbar, 1981; Babad, Inbar & Rosenthal, 1982a; Babad, Inbar & Rosenthal, 1982b), due to certain personality factors some teachers might be particularly vulnerable to stick to such initially formed expectations.

If various situational and individual moderating conditions provide the ground for the occurrence of such teacher-based SFP effects, one further interesting question to ask is, of course, which *intrapersonal mediating mechanism* actually underlies the effect of teachers' expectations on teachers' behaviours? Two different but related explanations based on empirical evidence have been put forward to answer this question. A study by Darley and Gross (1983) revealed a selective bias in cognitive processing towards the confirmation of a stereotype (e.g., an upper class student will show better performance compared to a lower class student)

during teachers' evaluation of students' performance. Teachers paid more attention to the positive aspects of a student's performance, if they held positive stereotype-induced expectations (e.g., upper class background) and vice versa more attention to negative aspects, if they held a negative stereotype-based expectation (e.g., lower class background). These attentional differences ultimately resulted in the divergence of teachers' judgments of student performance. A second alternative explanation was proposed by Tom and Cooper (1986), who demonstrated that teachers can exhibit an attributional bias once they had reached a performance judgment. For instance, teachers displayed more supportive attributional patterns to explain the performance of middle-class students (i.e., interpreting student's success as internal and failure as external) compared to their lower-class fellow students. Moreover, such different attributional patterns have been suggested to determine teachers' subsequent verbal (Covington, Spratt & Omelich, 1980; Medway, 1979) and affective reactions (Georgiou et al., 2002; Prawat, Byers & Anderson, 1983).

Furthermore, the works of Hofer (1970; 1981a; 1986)—focusing on teachers' implicit personality theories about their students—revealed that teachers not only rely on general social categories to classify their students, but also mentally assign their students into more classroom-specific categories (e.g., top students, introverts and clowns). Again, these classroom-specific categories are proposed to evoke specific attributional patterns in the teachers to explain their students' performance and in turn affected the teachers' classroom behaviour, e.g., instructional feedback (Hofer, 1981a; 1986; 1997; Hofer & Dobrick, 1981). Besides, as Hofer and Dobrick (1981) have stressed, these teacher attributions represent an important source of teachers' expectancies concerning student performance. Thus, this kind of categorisation might easily trigger off a SFP effect chain.

Regarding the occurrence of SFP effects on the basis of teachers' classroom-specific categories for their students, it is also important to

emphasise that again various moderators—individual and situational—have been exposed (Feldman & Saletsky, 1984; Finn, 1972). As such, results by Feldman and Saletsky (1984) identified teachers high in external locus of control as more susceptible to initiating a SFP effect on the basis of information about student ability. Moreover, Finn's (1972) study established a social context influence on the effect of labelling students as high or low in ability. In contrast to their suburban colleagues, urban teachers rated the essays supposedly produced by high ability students more favourably than the essays suggested to be written by low ability students. No differences in performance ratings were found for the suburban teachers, who had also received varying student ability information.

2.3.1.3 Summary

The specified research on SFP effects in teacher-regulated learning offers extensive insights into the moderation and mediation of teacher expectancy effects. Figure 2.1 summarises the results described for this type of SFP effect (highlighted in bold type). Depending on their individual personality characteristics (e.g., level of prejudice or perceptions of control) and the situational circumstances (e.g., length of teacher-student acquaintance or school location), teachers will develop particular expectations about their students' performance on the basis of the different information available to them about the students (i.e., general social and specific classroom-related characteristics). Some of these expectations will be positively or negatively biased relative to the actual ability level of the individual student. These biased expectations will further result in teachers' selective processing or biased attributions of students' performance, promoting different verbal and nonverbal instructional teacher behaviours towards the students. Ultimately, these behavioural differences will directly impact on the students' classroom-related outcomes. Reconsidering Rosenthal's affect-effort theory in the light of this complex causal chain, it certainly appears oversimplified.

However, it is important to note that—as Figure 2.1 already illustrates—the various findings generated on teacher expectancy effects are not mutually exclusive, but can be integrated with one another.

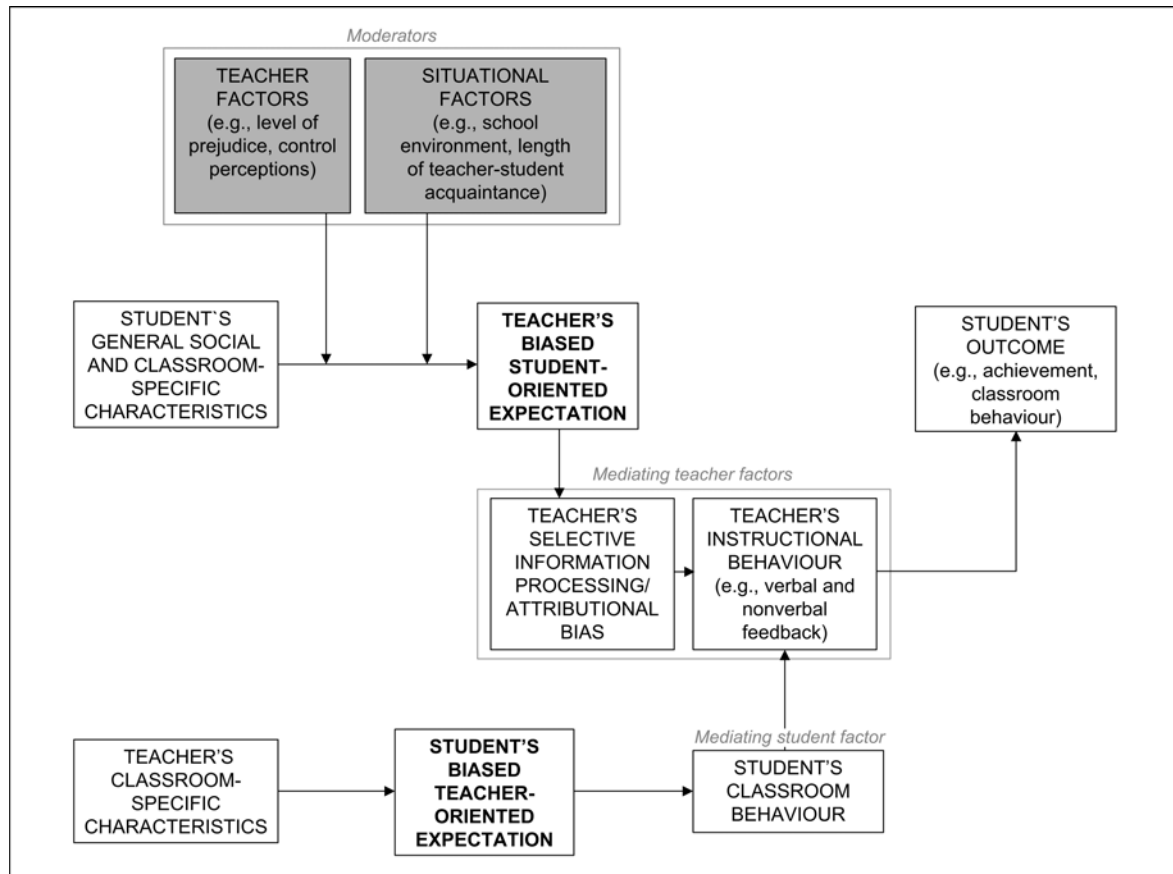


Figure 2.1

Integrative summary of the explanations given for the effect of teachers' student-oriented expectations and students' teacher-oriented expectations (in bold print) on students' outcomes

But even after this integration, the summary of the outlined explanatory accounts does not provide any further insight into *the role of the students and their expectations for SFP effects*—which is the main concern of the present investigation. Thus, only the explanation of students' teacher-oriented expectations delineated in Section 2.2.2 can be added to Figure 2.1 to emphasise that students' biased expectations also inhere the power to create SFP effects (this effect is again highlighted in bold type). As outlined earlier, student factors (i.e., students' classroom behaviours) have also been shown to be important for the mediation of this kind of SFP effect. Though ultimately it is again the teachers' behavioural response to

this student behaviour, which determines the student's outcome. Besides, which situational or individual conditions might moderate SFP effects generated by students' teacher-oriented expectations still remains an open issue.

Fortunately, some researchers have worked further towards an increased understanding of student factors involved in SFP effects in the classroom. We will consider their accounts next to find out whether they can contribute to specify an intrapersonal mediating pathway for the effect of students' expectations about a teacher's competence on students' classroom-related outcomes and, thus, for the effect of students' quality expectations about an instructional medium on students' self-regulated learning outcomes.

2.3.2 Student-Focused Explanations

Some researchers were able to demonstrate that students' self-oriented expectations perform an important mediating function for the effect of teachers' student-oriented expectations. Furthermore, different student characteristics have also been pinpointed as exerting important moderating functions for both the effect of teachers' student-oriented expectations and students' self-oriented expectations. Next, these different student factors and their mediating and moderating roles will be described.

2.3.2.1 Student Factors as Mediators

Several researchers have advocated student factors as important mediators of the effect of teachers' student-oriented expectations (e.g., Braun, 1976; Cooper, 1979b; 1985; Brophy & Good, 1974; Heckhausen, 1974; Jussim, 1986; Weinstein, 1985). In summary, their explanatory accounts generally acknowledge the complex causal network presented above (see Section 2.3.1.3), yet further contend that teachers' student-oriented expectations only affect students' performance indirectly. The

common vital mediator defined is the students' self-oriented expectations⁵. As such, teachers' differential expectations about their students' ability and the resulting differential instructional behaviour are thought to influence students' expectations about their own ability, ultimately determining students' classroom-related outcomes. Next, the relevant empirical evidence concerning this mediational chain will be considered.

Empirical investigations into the link between students' self-oriented expectations and students' performance have a long history, with varying foci on different theoretical constructs (e.g., academic self-concept, perceived locus of control, self-efficacy expectations or self-esteem; for a review see Eccles & Wigfield, 1985). A meta-analytical study by Hansford and Hattie (1982), however, could only identify a moderate positive relation ($r = .21$) between such motivational variables and students' achievement. Yet stronger relations ($r = .42$) were found for more specific measures (e.g., self-concept of ability in a particular school subject). Furthermore, field studies exploring whether students' self-oriented expectations indeed mediate the influence of teachers' student-oriented expectations on students' achievement have revealed a more complex pattern of results (Brattesani, Weinstein & Marshall, 1984; Jussim, 1989; Kuklinski & Weinstein, 2001).

The study by Jussim (1989) showed that students' self-oriented expectations could not make a unique contribution to students' achievement when teachers' expectations about the students' future performance level and students' prior achievement were statistically

⁵ Heckhausen's (1974) explanatory approach somewhat deviates from this focus, centring on students' causal attributions for their success and failure experiences. According to Heckhausen, and as outlined in Section 2.2, teachers generate from their expectations specific attributions for their students' failures and successes, which in turn influence students' own failure and success attributions and, thus, ultimately students' achievement-related behaviour as well as final academic achievement. However, since supporting empirical evidence on this causal chain of events appears to be very scarce and since Heckhausen also stressed that the relationship between changes in students' attributions and differences in students' outcomes is mediated via students' self-oriented expectations generated on the basis of their attributions, the main emphasis of the present discussion will be on students' self-oriented expectations.

controlled. But a series of studies by Weinstein and her associates (e.g., Brattesani et al., 1984; Kuklinski & Weinstein, 2001) highlighted that the mediation of teacher expectation effects via students' self-oriented expectations occurs only under certain individual student and situational context conditions. Controlling again for students' prior achievement, teachers' expectations affected students' actual achievement via students' self-oriented expectations only (1) within classrooms where students were treated noticeably differently (i.e., indexed via perceived differential treatment aggregated on classroom level) and (2) when students' were old enough to become aware of such discriminative teacher behaviour (i.e., indicated by age or classroom grade). This limited role for students' self-oriented expectations in mediating the effects of teachers' student-oriented expectations might be one reason for the lack of further empirical research regarding *how* such student expectations transmit their impact via intrapersonal processes onto students' final learning outcomes.

2.3.2.2 Student Factors as Moderators

Research on SFP effects on the basis of teacher and student expectations in teacher-regulated learning has identified further moderating functions of other student variables besides age (see Section 2.3.2.1 for details on the moderating effect of students' age on the effect of teachers' and students' expectations). Concerning the effect of teachers' expectations, a study by Madon, Jussim and Eccles (1997) revealed students' actual ability level as an important moderator. Students with low ability were more affected in terms of their achievement by their teachers' student-oriented expectancies than high ability students. As these authors explained, such effects might be due to an increased impact of teacher expectations on the level of motivation for this student group. This motivational increment might, in turn, have elevated students' achievement levels.

Regarding the effect of students' self-oriented expectations, a study by Feldman et al. (1983) stressed the importance of students' locus of control

as a moderating factor. Their study established that students with a high internal locus of control were more affected in their performance by the manipulation of their self-oriented expectations than their fellows with a more external locus of control. For the present research scheme it is also highly interesting to note that no such differential effect caused by locus of control was observed in this study for the effect of students' expectancies about their teacher's competence, the SFP effect appearing most closely related to the phenomenon to be explored. Although students significantly benefited from the induction of positive (vs. negative) expectations about their teacher's competence, this differential effect appeared independent of students' locus of control. The explanation put forward by the authors to account for these different moderating effects was as follows. Internals—because of their general belief in themselves being responsible for their own outcomes—were more influenced by information about their own potential than their fellow students with external locus of control. Students' locus of control exerted no comparable moderating influence for the impact of the information presented to them about their teacher's competence, because of externals' general belief that people usually have little control over situational outcomes.

However, it still seems plausible that just as some individual differences render certain teachers more prone to develop expectations about their students on the basis of some student characteristics and, thereby, more likely to trigger SFP effects, the same might hold for some student personality characteristics and the generation of effects caused by students' teacher-oriented expectations. Although no further studies on such vulnerability factors have been conducted so far, at least some evidence has been produced that students hold individual classroom-specific attitudes about their teachers and that these attitudes can be further grouped into more general categories (e.g., teacher's skills, rapport, course structure and level of difficulty; see for example Feldman, 1976; Hofer, 1981b; 1986; Kuklik & Kuklik, 1974; Nash, 1978; Wright & Sherman, 1965). On the basis of such attitudes, students might generate

expectations about their teachers' competence, which—as detailed in Section 2.2.2—can influence their final learning outcomes. Furthermore, a study by Leventhal et al. (1977)—also outlined in Section 2.2.2—stressed the importance of situational conditions (i.e., what the authors subsumed under the heading of lecture quality) for students' teacher-oriented expectation effects. However, with the ambiguity of the definition of these situational conditions in this study, no specific inferences can be drawn for the generation of quality information effects in self-regulated learning.

2.3.2.3 Summary

To sum up, past research has also delivered evidence of the significance of student factors within SFP effects in teacher-student interaction. Figure 2.2 represents an integrative overview of the different SFP effects pinpointed and their moderating and mediating conditions: the effect of teachers' student-oriented expectations, the effect of students' self-oriented expectations and the effect of students' teacher-oriented expectations (all highlighted in bold type). Compared to Figure 2.1, Figure 2.2 includes two important extensions regarding the role of student factors for these effects. First, students' self-oriented expectations are shown to exert a mediating effect over the effect of teachers' expectations on students' final performance outcome under certain moderating conditions (i.e., student age and classroom context). Furthermore, other student characteristics (i.e., student ability and locus of control) also play a significant moderating function for both the effect of teachers' student-oriented expectations and the effect of students' self-oriented expectations.

Nonetheless, the described research brought no further insight into the intrapersonal mediating student factors operating to generate SFP effects either on the basis of students' self-oriented expectations or on the basis of students' expectations about their teacher's competence. Similarly still found wanting are concrete suggestions about potential moderators of the

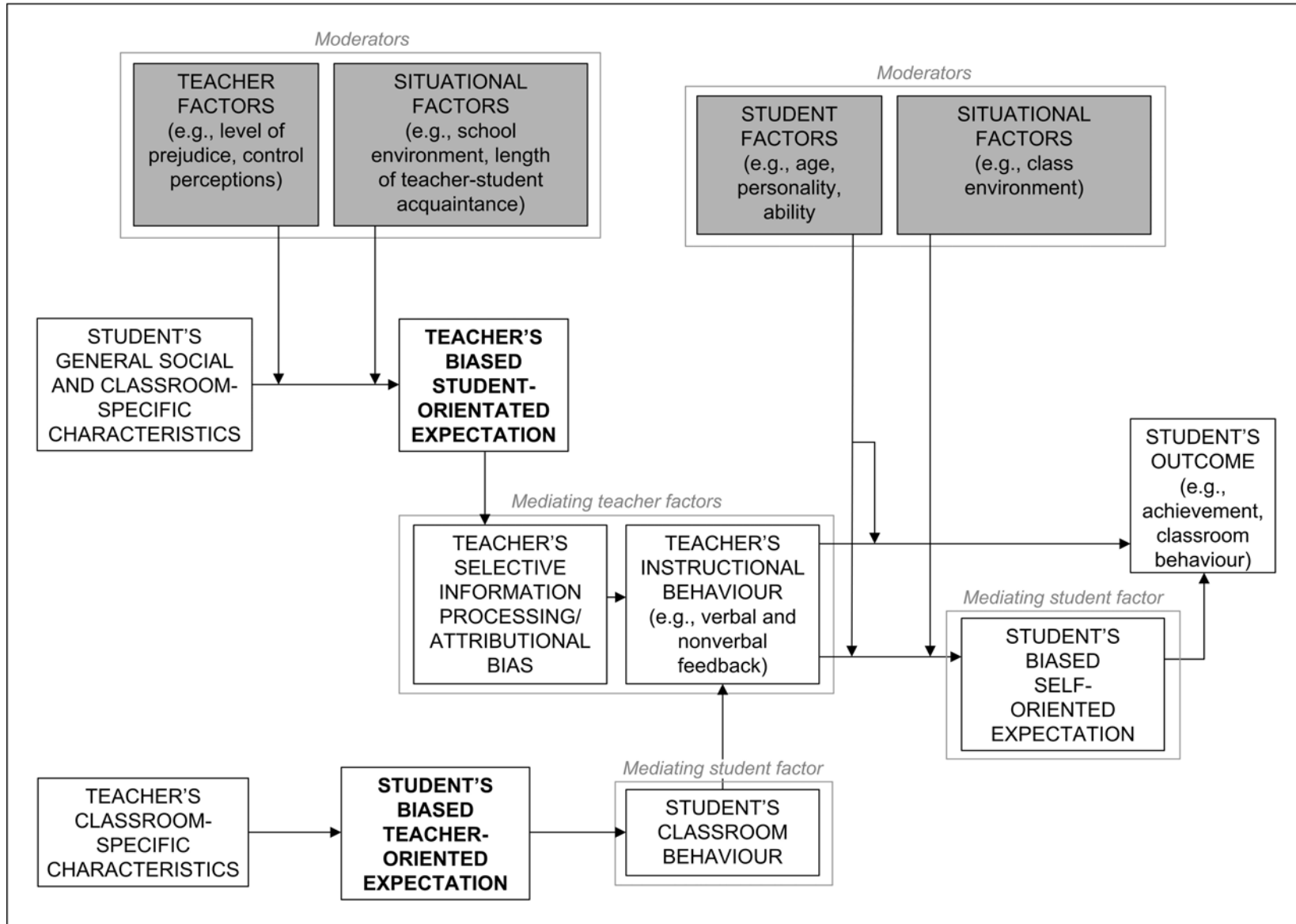


Figure 2.2

Extended integrative summary of the explanations of the different effects of teachers' student- and students' teacher- and self-oriented expectations (in bold print) on students' outcomes

effect of students' teacher-oriented expectations. Next, the overall implications of the outlined state of research on SFP effects in teacher-regulated learning for the current research objective will be discussed.

2.4 Implications for Quality Information Effects in Self-Regulated Learning

On a general level, research on SFP effects in teacher-regulated learning has highlighted that these effects—no matter whether they occur on the basis of teachers' student-oriented, students' teacher-oriented or students' self-oriented expectations—are highly complex phenomena. The essential common denominator of the explanatory accounts described is the fact that expectations make up a necessary, but not a sufficient, condition for the development of SFP effects. Rather different situational factors, as well as individual student and teacher characteristics, appear to act as moderators and result in different mediating pathways, usually involving interpersonal behavioural changes between the student and the teacher. These behavioural changes ultimately determine the various outcomes for both the teachers and the students. The importance of finding out about individual and situational moderators is a vital lesson to be born in mind for the present research undertaking. To be more precise, identifying significant moderating conditions will be the second main focus in the development of a model to explain the effects of quality information in self-regulated learning; in addition to discovering the intrapersonal mediating pathway involved in such effects.

On a specific level, the most important empirical result evidenced within the outlined studies was the effect of students' expectations about the competence of their teacher on students' achievement and satisfaction ratings of the teacher and the lecture. In a range of studies, it appeared that students' positive expectations about the competence of their teacher benefited the outcomes of students' teacher-regulated learning compared to negative or no expectations. On the basis of this finding it was suggested that similar effects might also occur with students' expectations

about the quality of an instructional medium in self-regulated learning. This reasoning was somewhat undermined by the fact that the only empirically validated explanation of this effect focused on interpersonal behavioural changes between the student and the teacher (see Section 2.2.2 for details). As stressed previously, usually no interpersonal processes should take place during self-regulated learning, making an intrapersonal account mandatory.

Still, the available evidence included three further important pieces of evidence in support of the assumption that a SFP effect can be realised on the basis of intrapersonal processes and, thus, might underlie the development of quality information effects in self-regulated learning. First, and as highlighted in Section 2.2.2, an effect of students' expectations about the lecturer's competence on students' performance appeared also within a video-based instructional session. This demonstrated that behavioural changes of the teacher are not a necessary condition for SFP effects on learning outcomes and, hence, that students' intrapersonal processes can suffice to bring about such effects also in self-regulated learning scenarios. Second, regarding the effect of teachers' expectations, two specific intrapersonal pathways occurring within the teacher were outlined (see Section 2.3.1.2). As such, on the basis of certain cues given about students' potential, teachers were shown to demonstrate either selective processing when observing these students' performances or biased causal attributions for the outcomes produced by the students. Although both of these intrapersonal pathways would not allow the prediction of students' differential achievement on the basis of quality information about an instructional medium—and respective quality expectations—at least these findings supply further evidence that an intrapersonal mediation of SFP effects is, in principle, possible. Third, support for the power of students' expectations has also been generated by studies showing that under specific conditions, students' self-oriented expectations can exert an independent effect on students' performances beyond the influence of teachers' expectations (see Section 2.3.2.1).

Nevertheless, empirical evidence from SFP research on the intrapersonal mediating pathway from students' self-oriented expectations to students' achievement—which might help to illuminate the mediating chain involved in quality information effects in self-regulated learning—is still lacking.

Now, to further back up the assumption that students' expectations are important in the context of self-regulated learning and, thus, that an effect generated by quality information about an instructional medium on students' outcomes is likely to arise, the Chapter 3 will proceed to the second important theoretical framework of the present investigation: research on self-regulated learning. Here, evidence for an intrapersonal mediational path causing effects of quality information about instructional media might be found.

3. Expectancy Effects in Self-Regulated Learning

Self-regulated learning by definition involves similar evaluative feedback loops to teacher-regulated learning, albeit these are defined as being self-oriented in nature (e.g., Zimmerman, 1989). Strictly speaking, rather than being told by the teacher how well students have performed on a given task, students themselves are responsible for judging their performance; during, as well as after, a learning episode. Such feedback can occur on a motivational level (i.e., via various self-oriented cognitions) or a behavioural level (e.g., self-reinforcement) and is thought to impact further on students' future performance. In this chain of events, students' expectations—about their own performance and about an instructional medium's quality—might take on an important role for their self-regulated learning process and outcomes. Indeed, dominant theories of self-regulated learning attribute students' expectations about their individual performance at a particular learning task—more specifically, students' self-efficacy expectations—a central role for the determination of students' outcomes (Boekaerts, 1999; Boekaerts et al., 2000; Puustinen & Pulkkinen, 2001; Zimmerman, 1986). The impact of students' expectations regarding the quality of the instructional medium employed for their self-regulated learning has so far remained unexplored.

This chapter will specify first existing theoretical work concerning the effect of students' self-efficacy expectations in self-regulated learning and will then outline relevant empirical studies that test the predictions deduced from this theoretical body of knowledge (Section 3.1). With this evidence, the intrapersonal mediation of the effect of students' self-efficacy expectations on their final outcomes will also become delineated. In addition, some studies will be introduced, which can be interpreted as the first empirical evidence for the effect of students' quality expectations about an instructional medium (Section 3.2). However, these studies have not been generated within the particular theoretical framework of self-regulated learning models, but have emerged in two other frames of

reference: research on students' general perceptions of instructional media and research on human-computer interaction. On the basis of these different lines of research, a preliminary intrapersonal explanation of the effects of quality information about an instructional medium will be elaborated. In the concluding section, the relationship between this intrapersonal explanation and the interpersonal explanations of SFP effects in teacher-regulated learning outlined in Chapter 2 will be discussed (Section 3.3).

3.1 Effects of Students' Self-Oriented Expectancies

Amongst current theories of self-regulated learning the perspective, which most clearly spells out the importance of students' self-efficacy expectations for their learning outcomes, is the one provided by Zimmerman (1989; 1990a, 1990b, 1998, 2000a; 2000b). Next follows a brief outline of this account alongside relevant empirical evidence.

3.1.1 Zimmerman's Model of Self-Regulated Learning

Zimmerman (1989; 1990a, 1990b, 1998, 2000a; 2000b) developed his model of self-regulated learning on the basis of Bandura's (1977a; 1977b; 1986, 1989; 1997) triadic theory of social cognition. He acknowledges self-regulated learning as a basic, complex human function, encompassing psychological, behavioural and situational variables as well as a causal reciprocity between these factors. Zimmerman also takes on Bandura's view that one of the most important psychological determinants of self-regulated learning is the expectation a person holds about his/her own capabilities to perform a given task even in the face of difficulties—which has become known as self-efficacy expectation. This type of expectation will determine how much a student will apply the appropriate self-regulated behaviour during the task; an application that is, of course, restricted by the student's knowledge of this behaviour. Moreover, after task completion, students' future self-efficacy expectations concerning this

type of task will be influenced by students' self-observation and self-evaluation of their current performance.

3.1.2 Evidence on the Effect of Students' Self-Efficacy Expectations

Empirical evidence supports the notion that students' self-efficacy expectations are significantly related to their self-regulated learning process and outcomes across a variety of tasks. Using a correlational approach, Zimmerman and Martinez-Pons (1990) illustrated students' mathematical and verbal self-efficacy expectations as significant predictors of their use of a range of self-regulated learning strategies in different hypothetical scenarios: Students with higher self-efficacy expectations in these areas stated a significantly greater use of reviewing notes, seeking peer assistance, self-consequating as well as organising and transforming strategies. Bouffard-Bouchard, Parent and Larivee (1991) established in a quasi-experimental study that a similar relation also existed when students engaged in a real learning task (i.e., a verbal concept formation task). The higher students' task-specific self-efficacy expectations were before the task, the more they applied the metacognitive strategy of self-monitoring during the task. Furthermore, the results also showed that students' self-efficacy expectations were related to their persistence and their final achievement: Students with higher self-efficacy expectations worked longer on the task and reached higher performance scores. Nonetheless, both studies might still be criticised in terms of not providing any final conclusion about the operating causality: Do students' self-efficacy expectations determine the outcome of their self-regulated learning or are such self-efficacy expectations determined by students' past self-regulated learning outcomes?

Support for the causal power of self-efficacy expectations in self-regulated learning has been presented by Zimmerman and Bandura (1994). Using a path analytical approach, they found that students' self-efficacy expectations of their academic achievement (i.e., expected grade) can have a direct and an indirect effect on their actual academic achievement (i.e.,

grade obtained) in a course on writing. The indirect effect of students' self-efficacy expectations was mediated by students' self-set goals. Most importantly, these self-efficacy expectation effects occurred even when students' verbal aptitude was statistically controlled. Similarly, studies by Pajares and his co-workers on students' achievement in essay writing and mathematical problem-solving have illustrated that students' respective self-efficacy expectations had a unique effect on students' achievement in these tasks, even if students' prior experience or aptitude was statistically controlled (Pajares & Johnson, 1996; Pajares & Kranzler, 1995). Furthermore, these studies showed self-efficacy expectations to indirectly impact on students' achievement via students' task apprehension and anxiety experiences. Another study by Wood, Bandura and Bailey (1990) also backed up the causal effect of self-efficacy expectations. This study showed that supplying students with different goals for their self-regulated learning (in a complex simulation environment on economic decision-making) impacted on their task-related self-efficacy expectations, which further determined their performance outcome. This effect of self-efficacy expectations appeared either directly or indirectly via the choice of analytic strategies.

Finally, a meta-analytical study by Multon, Brown and Lent (1991) on the relationship between students' self-efficacy beliefs and later academic outcomes across different educational scenarios reported the following result. Self-efficacy beliefs explain approximately 14% of the variance in students' academic performance and 12% of the variance in students' academic persistence. Similar relationships have been found between other cognitions closely linked to students' self-efficacy expectations (i.e., students' expectancies of success and students' ability perceptions) and students' use of self-regulated learning strategies as well as their final academic achievement (e.g., Pokay & Blumenfeld, 1990)⁶.

⁶ For in-depth discussions of the relation between these other self-oriented cognitions and the concept of self-efficacy refer to Bong and Clark (1999), Bong and Skaalvik (2003) or Pajares (2003).

3.1.3 Summary

Recapitulating the outlined results, students' self-oriented expectations appear to influence students' self-regulated learning outcomes either directly, or indirectly, by impacting on different cognitive, metacognitive, motivational and behavioural strategies applied by the students during their self-regulated learning. With regards to these student expectations, the issue of accuracy has not been explored sufficiently (Pajares, 2003). The general assumption seems to be that based on their past performance observations students simply create accurate expectations. This might not always be the case. Furthermore, Bandura (e.g., 1986) has explicitly mentioned verbal persuasion as an additional source of self-efficacy expectations⁷. Yet empirical research on the effects of verbal persuasion on students' self-efficacy expectations and their self-regulated learning outcomes is found wanting. This might be a potential reason why the findings on the effect of students' self-efficacy expectations in self-regulated learning have not become associated with the results of SFP effects produced by students' self-oriented expectations in teacher-regulated learning (see Section 2.2.1). However, following the rationale presented with the studies on teacher expectancy effects by Jussim (1989; 1991; see Section 2.1.2), at least the studies that have also taken into account students' prior performance and still showed an effect of students' self-efficacy expectations can be interpreted as evidence for SFP effects in self-regulated learning.

But even if these findings are taken to represent SFP phenomena, they bring two more problems to bear on the present research matter. First, they do not answer the question as to whether any effect of students' quality expectations about the instructional medium used for their self-regulated learning exists, since this phenomenon must surely be seen as an independent phenomenon to the effect of students' self-efficacy

⁷ The other three important sources of self-efficacy expectations described by Bandura (e.g., 1986) are one's own or other's performance behaviours as well as one's own physiological states.

expectations. Nonetheless, the results described have at least demonstrated that students' expectations do play a very important role in the context of self-regulated learning, too. The second problem is that the studies outlined have not defined one specific intrapersonal mediating pathway for the effect of students' self-oriented expectations in self-regulated learning. Instead, they have suggested a wide range of cognitive, metacognitive, motivational and behavioural strategies to be potentially involved. As shown by research on SFP effects in teacher-regulated learning, the initiation of such different mediational pathways will most likely depend on specific, yet so far unknown moderators. Still it is very important that the intrapersonal mediation of effects of students' expectations in self-regulated learning has received at least some empirical validation.

3.2 Effects of Students' Expectations about Instructional Media

In the light of the presented research on SFP effects in self-regulated learning, this section will reinterpret empirical findings yielded by research on students' general perceptions of instructional media as well as by research on human-computer interaction as evidence for SFP effects based on students' expectations about instructional media. Furthermore, these studies will provide more specific suggestions about the mediational pathway involved in such effects.

3.2.1 Effects of Students' General Perceptions of Text and Television

One important study, which might be reconstructed as one of the very few empirical traces on the effect of students' expectations about an instructional medium was directed by Salomon in 1984. Salomon's study corroborated that *prior* to an actual studying event, students held different perceptions regarding the realism of television-based and text-based instruction (e.g., how lifelike an instructional content can be presented using either text or television). Besides, students also displayed different attributional explanations for success and failure experiences with

television-based and text-based instruction. They perceived text-based instruction as less realistic than television-based instruction and more often assumed internal causes (i.e., ability and effort) as responsible for experiences of success with text-based instruction. Conversely, successful learning outcomes with television-based instruction were more frequently seen as being due to an external cause (i.e., medium's low level of difficulty). Failure events with text-based instruction were more often cited to reside externally to the student and within the instructional medium (i.e., high level of difficulty); in television-based instruction they were attributed more frequently to internal causes (i.e., ability and effort).

In a next step, Salomon went on to demonstrate that supplying students with the same learning content, but half of them receiving it in a text-based and the other half in a television-based format, resulted in differences across these two groups in terms of the amount of cognitive effort expended during self-regulated learning. Students provided with the television-based instruction stated less cognitive effort investment than students given the text-based instruction. Even more interesting, a similar pattern was found for students' final learning outcome: In an achievement task the television-based instruction group scored significantly lower than the text-based instruction group. Salomon took these differences in learning process and outcome as being caused by the initial divergence of students' perceptions and attributions concerning the two instructional media. Defining cognitive effort as "the amount of non-automatic mental elaborations applied to material" (Salomon, 1984, p. 647), he suggested that due to the higher realism of and the specific attributional explanations of success and failure in television-based instruction, students used less of such elaborative cognitive processing when presented with television-based instruction than students receiving text-based instruction.

Although one might question the comparability of the two different types of instructional media used in Salomon's study, his study nevertheless showed that students' judged these instructional media differently in two

important respects: perceived realism and causal attributions. From these differences, varying expectations about the individual quality of these instructional media might have developed. As has been pointed out in Section 2.3.1.2, attributions have already been suggested by past research on SFP effects in teacher-regulated learning as one important source for expectation generation. Now in Salomon's study, students' differential medium-oriented expectations generated on the basis of their differential medium-specific causal attributions might have brought about the effort and performance divergences and, thus, a SFP effect. However, the expectations involved in this particular setting are likely to be general and stable cognitions, triggered without any specific explicit quality information given about the instructional medium used. Therefore, besides the question of the experimental groups' comparability, one might ask whether explicit situational cues could affect students' expectations about the quality of a particular instructional medium at all. Remedy for both issues is provided with recent studies in the area of human-computer interaction. As will be shown immediately, in these studies the same instructional medium was provided to all participants and, still, situation-specific cues—which might be interpreted as quality indices—exerted an effect on participants' self-regulated learning outcomes.

3.2.2 Effects of Students' Situation-Specific Stereotyping of Computer-Based Trainings

Originally, the studies to be outlined dealt with stereotyping processes in human-computer interaction. In one study by Alvarez-Torres, Mishra and Zhao (2001), Asian students who learned with an English language programme, which was supposedly produced in the US and in which the introduction (which was irrelevant to the actual learning content presented subsequently only in written format) was spoken by a native American English speaker, recalled significantly more of the learning content than Asian students, who learned with the same programme, claiming to be produced in Mexico with the introduction spoken by an English speaker with a Mexican accent. Somewhat similar to Salomon's

explanation, the authors proposed changes in attentional processes as the significant mediator of this effect. Students studying with “the American programme” must have paid more attention to the content than students studying with “the Mexican programme”, ultimately provoking the performance differences between the two groups. Unfortunately, no empirical evidence was collected to support this explanation. Besides, the data collected about students’ subjective programme ratings after the instructional session indicated no systematic variation due to the manipulation of the programme’s place of production. According to Alvarez-Torres and his co-workers, this unexpected result might have been either due to the participants’ social desirability or the unconscious automaticity of the stereotyping process *per se*.

In a later, similar study by Mayer, Sobko and Mautone (2003), the effect of the speaker’s voice on students’ self-regulated learning outcomes was replicated. Here, students acquired more transfer knowledge in a brief computer-based instructional session on meteorological processes, if the learning content was supported by a voice-over in native US-American compared to a version supported by a voice-over with a Russian accent. Furthermore, compared to the speaker with the Russian accent, the speaker with the US-American accent was rated more positively in terms of a range of social characteristics (e.g., likeability or friendliness). In a second study, the authors were able to show a similar result pattern through the comparison of a US-American human speaker and a machine-synthesised voice. Besides, this study also revealed that students’ judged the understanding of the verbal explanations in particular and the learning content in general more difficult in the machine-synthesised voice-over version (compared to the human voice-over version). The size of the various effects reported was medium to large.

Mayer and his associates provided two different explanations for their effects. They stressed that these accounts were not to be seen as mutually exclusive, but rather to be combined to explain the various effects generated. Their first explanation, termed the “social agency theory”,

proposed the induction of particular conversational schemata through the social cue provided. These schemata would further determine the cognitive processing depth of the learning content. Strictly speaking, because of the native voice cue the students had perceived the interaction with the computer as a social conversation. This facilitated a deeper elaboration of the learning content by the students in this condition compared to the students in the non-native cue condition. In this latter condition, students had been primed for mere information intake and, hence, exerted only shallow elaboration of the learning content. These cognitive processing differences resulted in the variation of students' speaker ratings and achievement outcomes. Besides, because of the differences in students' difficulty ratings of the two programme versions, the authors resorted to the theory of cognitive load (e.g., Chandler & Sweller, 1991) as their second explanation: The foreign accent/machine-synthesised voice demanded more of the students' available cognitive resources, which meant that less of these resources were free for deep elaboration of the learning content under these conditions than in the native accent/human voice conditions. The extra cognitive load also contributed to the decrease in students' achievement.

3.2.3 Integrating the Different Preliminary Intrapersonal Explanations

Overall, the studies by Mayer et al. and Alvarez-Torres et al. support the assumption that just as students classify teachers and teachers classify students on the basis of social cues, students classify instructional media on the basis of relevant cues available. But how can the explanations provided by these two groups of researchers, as well as the one provided by Salomon to account for his results on the effect of students' general perceptions of different instructional media (see Section 3.2.1), be related with each other. And, even more important, how do these accounts link up with the question about the existence of quality information effects in self-regulated learning?

First, all of these explanations correspond in one pivotal aspect: They predict deeper and more effortful cognitive processing in response to certain characteristics of the instructional medium. However, a contradiction exists particularly between the account put forward by Mayer et al. and the ones provided by the other authors. First, whereas Mayer et al. would expect an achievement decrease due to high perceived difficulty of the medium, Salomon would predict an achievement increase. Furthermore, Mayer et al.'s cognitive load explanation also does not elucidate Alvarez-Torres et al.'s finding that differences in students' achievement also appeared with only the brief introduction (irrelevant to the learning content) being changed with respect to the voice-over's accent. In this case, the cognitive load of the learning content was absolutely identical across the two experimental conditions.

These inconsistencies might be resolved with one general explanation for the various effects described. All of these effects might be taken to represent SFP effects triggered through students' expectations concerning the quality of the instructional medium to be used for their self-regulated learning. Figure 3.1 represents an illustration of this preliminary intrapersonal explanation. First, students might already have expectations about an instructional medium's quality, or they might generate such expectations based on situational cues. Hence, a printed text might be expected to be better suited to deliver an instructional content than an instructional video shown on television. Similarly, a computer-based English language programme produced in an English-speaking country might be expected to be higher in quality than a programme produced in a non-English speaking country. And a computer-based programme on some scientific matter might be expected to be of lower quality, if the virtual teacher's voice carries a foreign accent compared to a native accent. In turn, these expectations should impact upon the cognitive processing of the learning content presented: High quality expectations should trigger effortful, deep processing and low quality expectations should bring about effortless, shallow processing. These processing

differences should lead to different levels of achievement by the students, with higher achievement resulting from effortful, deep processing compared to effortless, shallow processing. However, according to the outlined results the processing differences should not affect students' satisfaction ratings of the instructional medium. But considering that so far only one study has investigated this last aspect, further replication of this finding might be desirable.

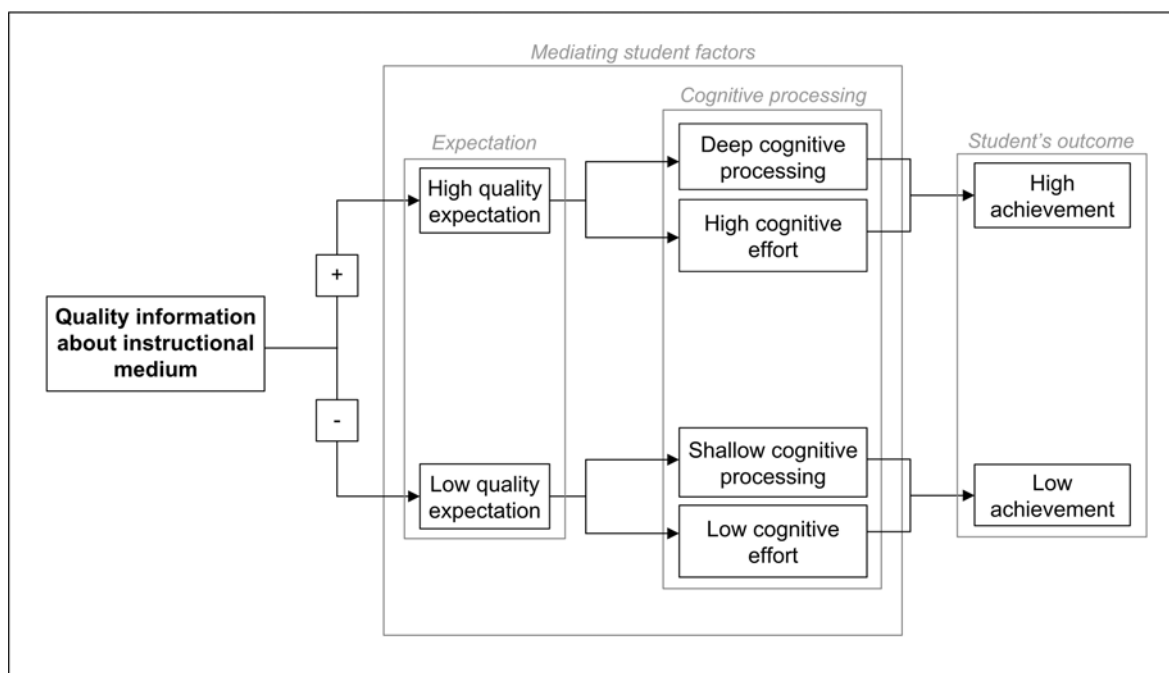


Figure 3.1

Preliminary intrapersonal explanation of the effect of quality information about an instructional medium on students' self-regulated learning outcomes

An important empirical back up for the presented reinterpretation of past evidence is brought with consumer research's firmly established finding that the information consumers have about a product's country of origin impacts on their respective product quality expectations (Verlegh & Steenkamp, 1999). Furthermore, two recent studies directed by Fries, Horz and Haimerl (in press) provided further empirical support that manipulating the quality information students receive about a computer-based training provokes systematic differences in students' self-regulated learning outcomes. The details of these studies are about to follow.

3.2.4 Effects of Quality Information about a Computer-Based Training

In each of the two studies conducted by Fries et al. (in press) students of computer science were allocated to one out of three conditions of quality information about the computer-based training to be used for studying. One group of students was told to study a specific computer science topic (i.e., algorithms for data compression) with a computer-based programme, which was of particularly high quality and had been developed under the supervision of the head of their department. The information about the programme's quality was supplied within a bogus article about innovations of university teaching ostensibly taken from the renowned popular German journal on computer technology "c't". The second group was told that they would have to study the same topic with a first test version of a computer-based programme, which had been developed by one of their fellow students within the course of a seminar and needed further improvement. This information was integrated within the general printed instruction on the experimental task. The last group of students was given no particular quality information, but was only asked to study with a computer-based training about algorithms for data compression. The computer-based programmes used in each of these three conditions were absolutely identical.

The quality information manipulation resulted in a systematic effect on students' outcomes in an achievement test in both studies. Students in the high quality version group performed best, the test version group scored lowest and the no quality information group's achievement lay in between. This effect appeared stable, even when detailed guiding questions to support the in-depth cognitive processing of the programme's content were given in the second study. Moreover, in the first study, students' satisfaction ratings after working with the programme were also collected and revealed a similar effect pattern. Students initially supplied with positive quality information rated the programme significantly higher than students provided in the beginning with negative quality information,

the ratings of students with no specific quality information again lying in between. All of the effects described were moderate to large.

Regarding the outcome variable achievement, the findings generated by Fries et al. (in press) are in line with the interpretation of the results generated by Alvarez-Torres et al. (2001), Mayer et al. (2003) and Salomon (1984) detailed in the previous section: Positive quality information about an instructional medium leads to higher achievement levels compared to negative quality information. However, the results concerning the outcome variable satisfaction contradict the evidence brought by Alvarez-Torres et al. (2001), who found no effect of their quality cues on students' satisfaction ratings of the instructional medium used. This mixed pattern of result might either be due to methodological differences (e.g., explicit vs. implicit quality cues) or due to the involvement of a moderating factor. At least for the effect of information about a teacher's competence on students' post-lecture ratings of their teacher, the results presented earlier (see Section 2.2.2) suggested the dependence of this effect on certain moderating conditions. Moreover, it appeared that this moderator had a different influence on the effect of teacher competence information with regards to students' achievement. This implies that different mediating pathways are associated with these two dependent variables. However, because of the ambiguous operationalisation of the moderator, it was not possible to deduce any specific implications for the present research question.

Somewhat similarly, the studies by Fries et al. (in press) produced no data relevant to the question of moderation and mediation of the effects of quality information about an instructional medium. Thus, their results cannot be taken as evidence for, or against, the postulation stated in the preliminary intrapersonal explanation (see Section 3.2.3) that students' quality expectations and cognitive processes are responsible for the mediation of the effect of quality information on students' achievement in self-regulated learning. Similarly, these studies cannot contribute to the specification of the mediating processes involved in the differential effect of

quality information on students' satisfaction. And finally, these studies offer no suggestions about the potential moderators of these different quality information effects.

3.2.5 Summary

Overall, the various studies presented in Section 3.2 delivered the first empirical evidence for the existence of SFP effects on the basis of quality information about an instructional medium on students' achievement and satisfaction with this medium. Similarly important, the various intrapersonal explanations put forward could be put together into a preliminary intrapersonal explanation, suggesting differences in students' cognitive processing as the second important mediator of the quality information effect on students' achievement. In contrast to the first mediator, students' quality expectations, students' cognitive processing strategies can be understood as the covert behavioural effect of quality information and respective expectations, ultimately realising the overt behavioural outcomes of students' self-regulated learning (i.e., achievement and satisfaction ratings). Despite this advance in finding evidence of the quality information effects in self-regulated learning and explaining its occurrence, there are four pressing issues that still need further attention.

First, the mediational explanation of quality information effects has received little empirical testing so far. Indeed, Salomon's finding concerning the differences in students' subjective ratings of their invested cognitive effort represents the only empirical fact. Therefore, more evidence supporting the mediational chain suggested in the preliminary intrapersonal explanation is necessary. Second, whether the same mediational path is underlying the effect of quality information on students' satisfaction with the instructional medium has so far remained an untackled issue. Third, suggestions are lacking about significant moderating conditions of these different quality information effects. Just how important the identification of moderators is, has been amply

demonstrated within research on SFP effects in teacher-regulated learning (for details see particularly Section 2.3). The fourth unsolved question concerns the relation between the preliminary intrapersonal explanation of SFP effects on the basis of quality information about instructional media and the interpersonal explanations of the various SFP effects outlined in Section 2.3. In the following, an attempt will be made to settle these final issues. The starting point will be the integration of interpersonal and intrapersonal explanations of SFP effects.

3.3 Integrating Interpersonal and Intrapersonal Explanations of Expectancy Effects

The theoretical and empirical research available strongly supports the existence of SFP effects in both teacher- and self-regulated learning. However, different explanations were supplied for the mediation of these different effects. Recapitulating, the explanations for SFP effects on the basis of students' self-oriented expectations in the context of self-regulated learning pinpointed a wide range of students' strategies (i.e., cognitive, metacognitive, motivational and behavioural strategies) as potential mediators of these effects (see Section 3.1). Furthermore, the preliminary explanation put forward for the impact of students' expectations concerning an instructional medium's quality asserted that such expectations might induce differences in students' cognitive processing and, therefore, affect students' self-regulated learning outcomes (see Section 3.2.3). These kinds of intrapersonal student-focused explanations have not been explored by research on SFP effects in teacher-regulated learning described in Chapter 2. Here, explanations of mediation centred on interpersonal behavioural changes occurring between the teacher and the student. For example, the effect most closely related to the phenomenon in focus of the present inquiry—namely, the effect of information about a teacher's competence and respective students' expectations—was explained as triggering, first, different nonverbal behaviours of the students. These, in turn, were suggested to impact on the teacher's instructional behaviour towards the individual student,

which would ultimately provoke differences in students' classroom-related outcomes.

In view of this variety of explanations, the question might be raised whether the presented SFP effects in teacher- and self-regulated learning do indeed represent one psychological phenomenon. As will be argued next, the various SFP effects share a very important function and it is this function that allows them to be considered as a unitary phenomenon. Furthermore, this common function will point to the third and last research area—namely, research on attitude formation—to be considered in the development of an explanatory model of quality information effects in self-regulated learning.

Now, for understanding the relation between the different SFP effects identified, the crucial question is: What is the use of expectancies in the first place? Addressing interpersonal expectancy effects in particular, Biesanz, Neuberg, Smith, Asher and Judice (2001, p. 621) provided the following answer: "Interpersonal expectations serve a valuable heuristic function: Without having to gather amounts of individuating information about others, we can gain an apparent understanding of them." In other words, the function of expectations lies in allowing quick information processing and behavioural reaction based on specific cues in social situations that require subjective judgment or action and, thus, in removing the need to take into account all the information presented. In support of their argument, the authors showed that the effect of interpersonal expectancies depended on expecters' attentional resources. A decrease in available attentional resources via the requirement to fulfil another cognitive task resulted in an increase in interpersonal expectancy effects, even for highly accuracy-motivated perceivers. As proof, Biesanz and his colleagues used a mock job interview situation, whereby they instructed the interviewers specifically to form the most possible accurate impression of the interviewees. When sufficiently distracted by a second task (i.e., pushing a foot pedal when a specific letter appeared on a computer screen in sight of the interviewer), even such accuracy-

motivated interviewers created SFP effects on the basis of bogus past records of the interviewees. More specifically, a SFP effect was revealed for the interviewers' information-gathering behaviour during the interview, the interviewees' responses and the interviewers' final impression of the interviewee. On the contrary, no such effects occurred for interviewers, who were able to concentrate exclusively on the interviewing task.

The vital question for the present undertaking is, of course, how these findings apply to educational scenarios. For teachers in the classroom, it could mean that working with a group of 30 students might leave no choice, but to use heuristic expectations to guide their own reactions towards the students—if they want to get through with the curriculum. Similarly, students both in the classroom or working on their own at home might not always use all of their cognitive processing capacities by default. Rather, on the basis of various social cues, they might form expectations about the competence of their teacher or the quality of the instructional medium to be used, affecting the degree of effort and cognitive elaboration exerted during studying and, ultimately, students' outcomes.

Of course, for both teachers and students, the cost of this efficient and economic use of their cognitive capacities lies in the potential for biased behaviour. Just as teachers' student-oriented expectations based on social cues about their students can result in biased cognitive, attributional, verbal and nonverbal behaviours towards the students, students' teacher-oriented expectations based on social cues about their teacher can bring about biased nonverbal behaviour towards the teacher. Also, students' expectations about the quality of an instructional medium developed on the basis of respective cues can trigger biased cognitive behaviour towards the instructional medium. Hence, biased behaviour—either displayed overtly or covertly—seems to be the second suitable overarching construct to synthesise inter- and intrapersonal explanations of the various types of SFP effects sketched. In line with this view Chow (1988, p. 96) stated with respect to research on teacher expectancy effects the following: “The phrase “teachers' self-fulfilling prophecies” is often nothing more than a

euphemism for the consequences of a teacher's biased actions. Because the effects of biased action are being studied, they should not be given an innocuous characterization." It is important to note that the term bias, despite having a negative ring to it, does not necessarily imply a negative outcome. Equally well, bias might produce a positive outcome.

To conclude, the commonality of interpersonal and intrapersonal SFP effects appears to lie in the functionality of the expectations involved in these effects. These expectations appear to act as behaviour-guiding heuristics; saving cognitive resources while carrying the potential for biased responses. Despite this parallel across the various SFP effects, different expectancies exert their influence via different mediational pathways, facilitated by specific situational and individual conditions. The mediational chain proposed for SFP effects generated by quality information about an instructional medium—involving changes in quality expectations and cognitive processing—has so far received little empirical testing. Likewise, no suggestions about relevant moderator variables, promoting the occurrence of such a mediated effect, exist. And last, but not least, the existing evidence on the effect of quality information on students' satisfaction with an instructional medium is mixed.

To gain further theoretical and empirical ground in these various respects, Part II of this dissertation will turn to an area of research so far not associated with educational issues: research on attitude formation. Here, a question appearing very similar to the current one has been explored for several decades: *How do cues about the competence of a source presenting a persuasive message affect recipients' cognitive processing of this information and, hence, ultimately determine their attitude formation?* As will be shown, attitude researchers have demonstrated that such source cues can also exert a heuristic function to decide, which kind of cognitive strategy will be used to process a persuasive message and, thus, can bias attitude formation. Furthermore, the attitude construct appears quite closely related to the construct of satisfaction. Finally, detailed predictions

about the moderating conditions of the effect of competence cues about an information source have been established.

PART II: SELF-FULFILLING PROPHECY AND BIASED COGNITIVE PROCESSING

“Learning in its generic sense, greatly depends on the differential way in which sources of information are perceived, for these perceptions influence the mental effort expended in the learning process.”

Salomon (1983, p.42)

Despite Salomon’s recognition of the importance of students’ perceptions of information sources for their cognitive investment into learning and, thus, for their final learning outcomes, the preceding chapters have established that SFP researchers have not been concerned with this kind of cognitive mediation. As outlined earlier in Section 3.2.1, Salomon’s (1984) empirical work dealt with television- and text-based instruction and not with teacher-regulated instruction. Nonetheless, SFP effects based on information concerning a teachers’ competence—the effect appearing most closely related to the phenomenon in question—might also be designated as an effect of students’ perceptions regarding an information source. Within research on attitude formation a long-lasting tradition of inquiry into the effects of certain characteristics of information sources—such as a source’s competence level—on recipients’ cognitive processing of the information presented exists. Half a century ago, Hovland and his co-workers (e.g., Hovland & Weiss, 1951; Kelman & Hovland, 1953) showed that a speaker who is perceived to own a high level of competence is more persuasive than a speaker who is perceived to have little competence⁸. Therefore, the perceived competence of the source of a persuasive message can bias the recipient towards adapting to or rejecting a particular attitudinal position. For example, in Kelman and Hovland’s (1953) study,

⁸ Hovland and his co-workers (e.g., Kelman & Hovland, 1953) define their manipulation rather vaguely as manipulating positive vs. negative communicator cues, whereby they cite a whole range of communicator characteristics to be inferred from these cues (i.e., trustworthiness, prestige and likeability). Later studies (e.g., DeBono & Harnish, 1988) using a similar manipulation referred to this manipulation as the variation of source expertise, which is the meaning also attributed in the current discussion. However, in the present context the use of the term competence seems more appropriate in order to align the vocabulary of research on SFP effects in education and research on attitude formation.

recipients were more likely to be persuaded about the necessity to change the treatment of juvenile delinquents when the argument was supposed to be given by the presiding judge of the city's Juvenile Court and not by some average man on the street.

At first, the authors of these studies put forward the following simple explanation for their result: Compared to negative competence information, positive competence information promoted learning of the message content and, hence, persuasion into the attitudinal position. However, subsequent studies were not always able to replicate such source effects, showing either no main effect of the described variation of source competence⁹ or even reverse effects (e.g., Bock & Saine, 1975; Dean, Austin & Watts, 1971; Dholakia & Sternthal, 1977; McGinnies, 1973). Clarification of the mixed findings concerning the generation of source effects was provided by a model dominating the research area of attitude formation ever since: the Elaboration Likelihood Model (ELM; Petty & Cacioppo, 1986a; 1986b; Petty & Wegener, 1999)¹⁰.

⁹ The studies cited referred to their individual experimental manipulation either as varying source credibility or source status. Yet all of the manipulations used included information about the message source's competence or expertise and, thus, this is how the various experimental treatments are interpreted. To give one concrete example, Dholakia and Sternthal (1977) described their highly credible source as: "...a Harvard-trained lawyer with extensive experience in the area of consumer issues and a recognized expert whose advice was widely sought." (p.226) and their low credible source as "...an individual with no special expertise." (p.226).

¹⁰ Of course, the ELM is not the only model currently thriving within research on attitude formation, some authors having proposed alternative models. Whereas one group of researchers suggested a highly similar, yet extended model (i.e., the Heuristic-Systematic Model = HSM) to fill in some theoretical gaps suggested to exist within the ELM (Chaiken, 1987; Chen & Chaiken, 1999; Chaiken, Liberman & Eagly, 1989; Eagly & Chaiken, 1993), others (Kruglanski et al., 2003; Kruglanski & Thompson, 1999a; Kruglanski & Thompson, 1999b; Kruglanski, Thompson & Spiegel, 1999; Thompson, Kruglanski & Spiegel, 2000) have advocated within their explanatory approach (i.e., the Unimodel of Persuasion) the complete elimination of one of the essential ideas of the ELM: the existence of two distinct cognitive processing modes underlying attitude formation.

Whereas the former group of authors attenuated their own criticism by stressing the HSM as being highly similar and, thus, as complementary to and not opposing the ELM, the latter research group appeared doomed to failure, since they challenged at the same time various other prominent dual-process models in different domains of social judgment, whose proponents, or rather their counter-arguments, did not give way to this criticism (e.g., Ajzen, 1999; Bohnet & Siebler, 1999; Eagly, 1999; for an overview of existing dual process models see Chaiken & Trope, 1999). Furthermore, as stressed by the ELM authors, many of the criticisms against the ELM are due to severe

For the present research question the ELM appears highly useful, since it has specified in great detail (1) the moderating conditions promoting the occurrence of bias effects¹¹ on the basis of information about the competence of a message source, alongside (2) the underlying mediating cognitive processes. Most noticeably, these mediating processes (i.e., different levels of elaboration depth) appear very similar to the ones described in the preliminary intrapersonal explanation of the effect of quality cues about instructional media (see Section 3.2.3). Of course, the ELM centres on recipients' attitude formation on a particular issue and not on their knowledge acquisition in a particular subject domain. But still the second dependent variable in focus—students' satisfaction with an instructional medium—closely resembles the construct of attitude. Chapter 4 and Chapter 5 will provide further support for the applicability of the ELM and its predictions concerning the effect of cues about an information source's competence to the phenomenon in focus. At the end of Chapter 5, the ELM will be modified to explain the effect of quality information about an instructional medium in self-regulated learning, together with its mediating and moderating conditions.

misunderstandings of its main assumptions (Petty & Wegener, 1999; Petty, Wheeler & Bizer, 1999; Wegener & Claypool, 1999). Hence, despite these rivalling models, even its ostensible critics still acknowledge the ELM as "...a powerful and integrative empirical framework for studying persuasion processes." (Eagly & Chaiken, 1993, p. 323).

¹¹ Within the ELM, the term bias is used to refer particularly to the induction of deep, yet selective, processing of certain message aspects, triggered because the recipient already has prior knowledge on the topic and similarly has already adopted a particular attitudinal position, which he/she—consciously or unconsciously—seeks to retain via the selective processing (Petty & Cacioppo, 1986a; 1986b; Petty & Wegener, 1999). In the present discussion, this use of the term bias will be extended, since the term bias seems also applicable when source characteristics influence either the cognitive processing depth or the attitude outcome or both, as suggested by the ELM.

4. Explaining Effects of Information Source Characteristics: The Elaboration Likelihood Model (ELM)

The first step towards transforming the ELM into a model of quality information effects in self-regulated learning will be a short introduction into the ELM and its predictions regarding the effect of cues about an information source's competence on recipients' attitude formation. As a matter of course, the major focus will be on the assumptions relevant to the current research issue.

4.1 Two Modes of Processing

The ELM's starting point is the assumption that people are generally determined to hold accurate attitudes (Petty & Cacioppo, 1986a; 1986b; Petty & Wegener, 1999). Yet as Petty and Wegener (1999, p. 44) have further stressed, this "...does not imply that people cannot be biased in their assessment of evidence, however...people are rarely explicitly motivated to be biased." Furthermore, the ELM's authors make a similar point to the one made earlier in the integrative discussion of inter- and intrapersonal explanations of SFP effects in education (Section 3.3): People are often best described as cognitive misers, who—due to constraints of time and resources—do not always process the information presented to them with great effort and in depth, but also use a more superficial processing mode (Petty & Cacioppo, 1986a; 1986b; Petty & Wegener, 1998; 1999).

This latter approach is termed in the ELM *peripheral processing*. Here the recipient of an attitudinal message makes use of simple heuristic rules (e.g., "Experts are always right." or "The majority is always right.") to arrive at a particular attitudinal standpoint. Such heuristic rules are explained as being triggered by respective heuristic cues present in the

persuasive communication situation¹². For example, if an article on a particular political position is said to have appeared in a news magazine regarded as highly knowledgeable on political issues (e.g., *Der Spiegel*), readers might be more likely to adapt to the advocated position than if the article is attributed to a general interest magazine believed to have little competence in this respect (e.g., *Bild der Frau*). This kind of cognitive processing saves the reader from investing the great amount of cognitive effort, which would be required by the second alternative processing mode. This high effort strategy is called the *central processing* mode. When using this kind of processing to arrive at an attitudinal standpoint, the application of heuristic rules for attitude formation is outweighed by an in-depth consideration of the message content and its various individual arguments. Central processing also involves the use of relevant preliminary knowledge.

The existence of these two different cognitive routes to attitude formation represents the core assumption made by the ELM. These two processing modes appear very similar to the ones described earlier within the preliminary intrapersonal explanation of the effect of quality information about an instructional medium in self-regulated learning (see Section 3.2.3): effortless, shallow processing vs. effortful, deep processing. However, as outlined so far, the information given about a source's competence appears only relevant once peripheral processing is already induced. Yet, it is important to note that the ELM additionally defines multiple roles for source characteristics in attitude formation (Petty & Cacioppo, 1986a; 1986b; Petty & Wegener, 1998; 1999). As will be specified in the following section, source characteristics can not only function within the peripheral processing mode as heuristic cues, but can

¹² Besides the use of simple heuristic rules, the ELM also discusses other effortless, peripheral processing mechanisms triggered by certain source characteristics within the context of attitude formation (e.g., classical conditioning [e.g., Cacioppo et al., 1992], or misattribution of affect to the message [e.g., Petty & Cacioppo, 1983]). The current discussion will use the mechanism of heuristic processing to illustrate how the ELM construes the peripheral processing mode.

also determine, which of the two types of processing will be initiated in the first place.

4.2 Multiple Roles for Source Cues

Generally, the ELM depicts the two cognitive processing modes as being determined by various individual factors (e.g., preliminary knowledge, need for cognition or content relevance) and situational factors (e.g., source characteristics, communication channel or disruption). These different factors either affect the recipient's motivation or capacity for cognitive processing. The recipient's motivation and capacity to process is subsumed under the construct of elaboration likelihood. Under some conditions, motivation and capacity to process are high and, thus, elaboration likelihood is high. This provides the ground for central processing. If the individual and situational preconditions restrict the recipient's motivation and capacity to a low level, the elaboration likelihood will similarly be at a low level. In this case peripheral processing will occur.

Now, the effect of source characteristics (such as a source's level of competence) on the elaboration likelihood and, hence, on cognitive processing, has been defined as particularly dependent on one individual factor: the relevance of the topic at hand to the recipient or, in other words, the degree to which a person is affected by the content of the attitudinal message within their personal life¹³ (Petty & Cacioppo, 1986a; 1986b). For example, a person might react differently to a message

¹³ In their meta-analytical analysis of research on the effect of relevance and related constructs on persuasion, Johnson and Eagly (1989) draw an important distinction between outcome-related involvement (i.e., the issue carries an important consequence for the individual), value-related involvement (i.e., the issue concerns an individual's general value system) and impression-related involvement (i.e., the issue is relevant to make an impression on other people). Outcome-related involvement is congruent with the notion of relevance used in research surrounding the ELM. Furthermore, Johnson and Eagly's (1989) meta-analytical results confirmed the ELM's assumption about the role of relevance/outcome-relevant involvement in attitude formation. For the other two involvement constructs this was not the case. The current investigation adheres to the ELM's definition of relevance and, thus, the focus is on outcome-related involvement and not on value- or impression-related involvement.

regarding the use of nuclear power plants, depending on whether he/she is additionally informed that one will be built in the local area vs. in another, far away country. Now, how do the factors content relevance and source competence interact upon recipients' cognitive processes involved in attitude formation?

According to Petty and Cacioppo (1984a, pp. 669-670) "source factors tend to affect agreement with a message by serving as simple acceptance or rejection cues when the elaboration likelihood is low, but do not serve as simple cues when elaboration likelihood is high...However, when the personal implications and consequences of the message are moderate or unclear, people are not certain whether or not the message is worth thinking about. Under these circumstances, characteristics of the message can help a person decide whether or not the message is worth considering."¹⁴. Therefore, whereas under low elaboration likelihood, or rather low content relevance, source factors act as heuristic cues to arrive at an attitudinal standpoint, under moderate content relevance source factors act as heuristic cues to decide which kind of cognitive processing will be used. Why then does the factor content relevance occupy this moderating function on the effect of cues about the information source?

If a message's content is of high relevance to a particular person, source characteristics do not impact on attitude formation, because under this condition effortful, central processing has been shown to be the preferred mode employed to form an attitude¹⁵. This processing mode requires a significant amount of cognitive effort. However, if content relevance is low, low elaboration likelihood will prevail and, thus, the peripheral mode will

¹⁴ In other words, moderate or ambiguous content relevance means that a person cannot be entirely sure whether the attitudinal message holds any relevance to his/her life e.g., if an individual might soon be moving very far away from the supposed building site of a nuclear power plant.

¹⁵ However, source variables might still influence persuasion under high relevance conditions, if they can function as a persuasive argument themselves (Petty & Cacioppo, 1986a; 1986b). For instance, the physical attractiveness of a model in a beauty product advertisement might be taken in itself as a supportive argument. But since the information about the quality of the instructional medium never forms part of the actual learning content, this function seems irrelevant in the current scenario.

be applied to process a message. Source characteristics will be used as simple heuristic cues to arrive at an attitudinal standpoint. More specifically, if, for instance, a message source is presented as highly competent, recipients will adopt the attitude put forward, whereas low source competence will lead to the recipients' rejection of the attitude. This attitude formation process consumes little cognitive effort.

Now, under moderate content relevance, source characteristics will be used as heuristic cues to decide which kind of cognitive processing is appropriate (see Figure 4.1). *Positive information* about some source characteristic (e.g., high level of competence) will lead to high elaboration likelihood and *effortful, central processing* of a persuasive message, whereas *negative information* (e.g., low level of competence) will result in low elaboration likelihood and *effortless, peripheral processing*. Both of these cognitive strategies can lead to the formation of an attitude. Yet attitudes based on central processing have been found to be more persistent over time, more resistant to future persuasion attempts and also more predictive of future behaviour (Petty, Haugtvedt & Smith, 1995). The reasons supplied for the characteristics of central-processing-generated attitudes by Petty et al. (1995) are as follows. On the basis of detailed elaboration of the message content more consistent cognitive representations are likely to be built, because related, already existing, cognitive structures are repeatedly activated while the new information is assembled into memory and associated with these pre-existing structures. Hence, the entire attitude-related cognitive structure is rendered more accessible in long-term memory.

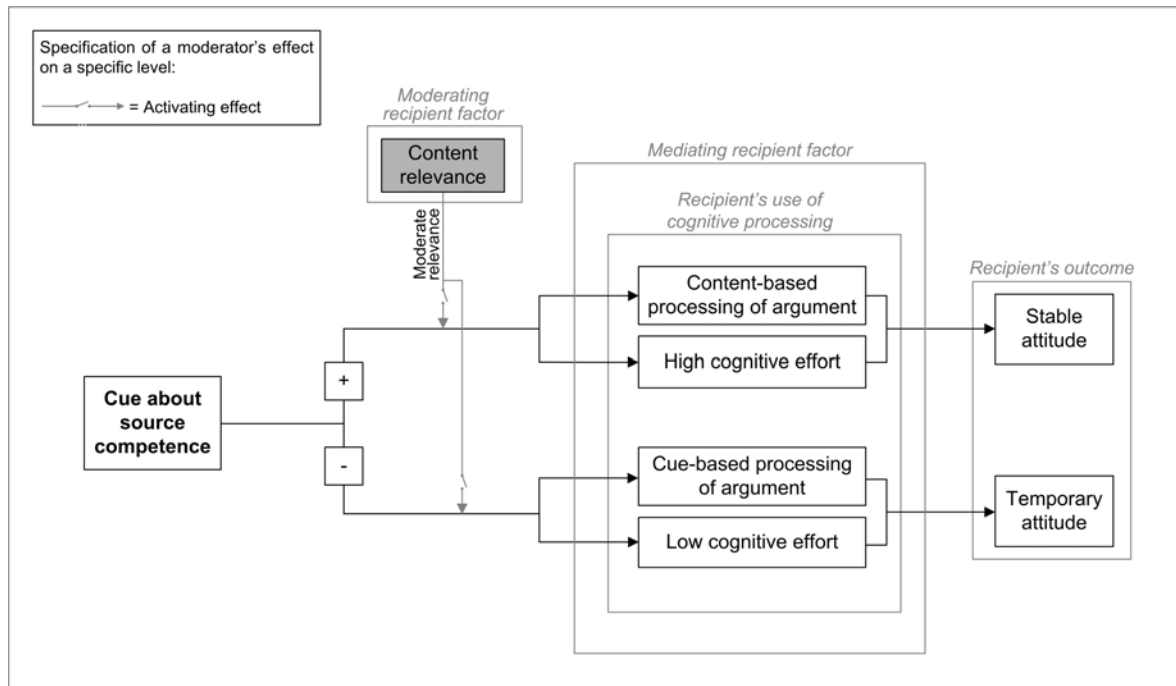


Figure 4.1

The effect of source competence cues on cognitive processing in attitude formation given moderate relevance (Petty & Cacioppo, 1986a; 1986b; Petty & Wegener, 1998; 1999)

Contrary to the illustration presented in Figure 4.1, it is important to stress that the ELM's authors see the two processing modes not as two distinctive categories, but rather as opposing poles of a cognitive elaboration continuum (cf. Petty & Wegener, 1999). More specifically, they allow for the co-occurrence of central and peripheral processing, but in their view the impact of peripheral processing—and, thus, the impact of source characteristics as simple acceptance or rejection cues—on attitude formation declines, as the impact of central processes increases alongside the elaboration likelihood. This view is illustrated in Figure 4.2, adapted from Bohner and Wänke (2002, p.138).

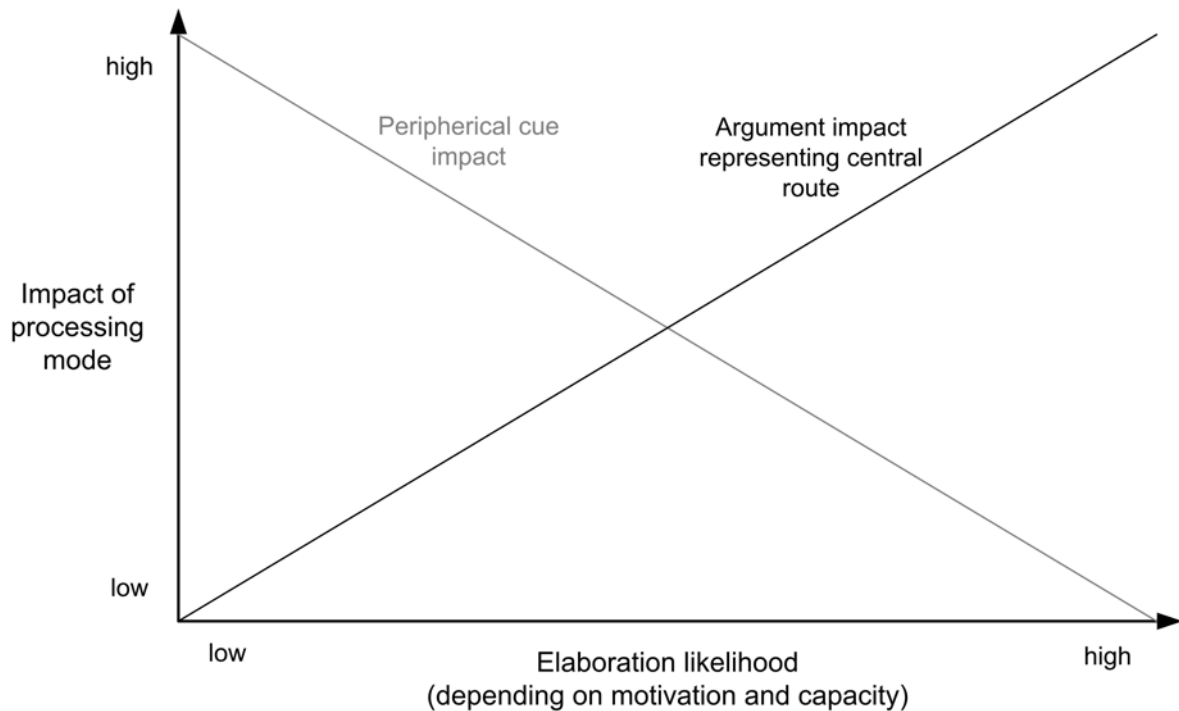


Figure 4.2
Impact of the two processing modes on attitude formation as described by the ELM
 (adapted from Böhner & Wänke, 2002, p. 138)

4.3 A First Application of the ELM to Explain Quality Information Effects

After this brief overview of the ELM, the question now is: How do the outlined predictions about the effects of source competence on attitude formation relate to the effect of quality information about an instructional medium in self-regulated learning? If readers of an article on a specific attitudinal position might be differently affected in their cognitive processing of this article and their respective attitudinal outcome depending on whether they assume that the article originated from a high or low competence source, then students might be similarly differently affected in their cognitive processing of an instructional medium's learning content, depending on whether they have been told that the instructional medium is of high or low quality. These differences in cognitive processing might ultimately impact on their achievement outcomes. Indeed, this is exactly what has been suggested by the preliminary intrapersonal explanation (see Section 3.2.3). Yet the ELM would hold that the

generation of this quality information effect would depend significantly on the level of relevance of the topic at hand to the students.

Given *high relevance* of the content of an instructional medium to the students, quality information should have no effect on students' achievement, since in this case students should execute effortful, deep/central processing strategies, focusing on the learning content presented by an instructional medium. As a result, students' achievement levels after the self-regulated learning phase should be in accordance with the instructional medium's objective quality¹⁶.

Conversely, given *low relevance* of the learning content, effortless, shallow/peripheral processing is predicted to be the predominant cognitive processing mode. Thus, again no differences should become established on the basis of different quality information about an instructional medium with respect to students' achievement, since the use of peripheral processing should result in low achievement levels for both quality cue conditions; irrespective of the objective quality of the instructional medium and the presented content.

Most importantly, given *moderate relevance* of the learning content, quality information should directly impact on the processing mode taken: Positive information about an instructional medium should lead to effortful, deep/central processing and negative information to effortless, shallow/peripheral processing of the learning content. Given that the

¹⁶ Within the present investigation the role of the objective quality of the information presented will not be explored, but hold constant at a high level. Within studies conducted in the context of the ELM, however, the objective quality of the arguments presented within a persuasive message is construed at a high and a low level (i.e., strong vs. weak arguments contained within a message, respectively). This variation is used to indicate the processing mode applied by the recipient to arrive at a final evaluative judgment concerning the attitudinal object. That is whether or not the recipient has mainly elaborated on the message content and, thus, used central processing, or whether he/she has not really taken into account the presented arguments, but rather relied on peripheral processing (Petty & Cacioppo, 1986a; 1986b; Petty & Wegener, 1999). In the current investigation, a direct measurement approach to identify potential differences, occurring in terms of students' cognitive processing strategies during self-regulated learning will be applied (e.g., Pintrich, Smith, Garcia & McKeachie, 1993; Wild & Schiefele, 1994).

instructional medium can be objectively judged as sufficiently good in quality, the outcome of these processing differences should be higher levels of achievement for students supplied with positive quality information than for students, who received negative quality information.

In a similar manner, the ELM might be used to explicate the moderating and mediating conditions of a SFP effect triggered by quality information about an instructional medium on students' satisfaction with this medium. As has been mentioned before, it is important to highlight that the satisfaction construct can be seen as closely related to the construct of attitude, since both have been defined as evaluative responses (for an overview of the construct of satisfaction see for example Westbrook & Oliver, 1981; for an overview of the construct of attitude see for example Bohner & Wänke, 2002). Yet, whereas attitudes have been defined as summary evaluations of objects, issues, other people or oneself on a positive-negative continuum (e.g., favouring/opposing G. W. Bush or liking/disliking football), satisfaction has been described as the evaluation of the perceived outcome of one's experience with a particular object, person or life domain (e.g., satisfaction with the car you drive, satisfaction with the job you do, satisfaction with the spouse you are married to, etc)¹⁷. The more positive the evaluation of the experienced outcome is, the higher is the level of satisfaction. Because of the described overlap in definition, it seems justified to assume that the predictions of the ELM for attitudinal outcomes outlined above apply to students' satisfaction in an identical manner.

¹⁷ Despite this similarity in definition of attitudes and satisfaction, measurement approaches to these two constructs are essentially different. Whereas attitudes are measured on a dimensional scale indicating feelings of like-dislike, good-bad or desirable-undesirable (e.g., Bohner & Wänke, 2002; Himmelfarb, 1993), measures of satisfaction include a great variety of measurement procedures (e.g., Westbrook & Oliver, 1981). Most commonly across the various application areas (e.g., job satisfaction, product satisfaction, life satisfaction or marital satisfaction) is the use of simple single item "very satisfied" to "dissatisfied" self-report scales, yet the use of more complex multi-item instruments measuring the various cognitive-evaluative, affective and behavioural elements of satisfaction in a Likert-style format has been suggested to be more appropriate (e.g., "X was very useful.", "I felt very pleased with x.", "I would do x again.", respectively).

Given *high relevance* of the learning content, no effect of quality information about an instructional medium should occur on students' satisfaction with this medium, because of the domination of the central processing mode. Thereby, the focus should be on the learning content presented, and not on any heuristic cues. Students' final satisfaction ratings, thus, should correspond with the objective quality of the instructional medium and its content.

Given *moderate relevance*, quality information should determine the type of processing used and, hence, should exert an effect on students' satisfaction ratings of an instructional medium. Positive quality information should trigger central processing. This means that students should establish their satisfaction ratings on the learning content and its objective quality. Negative quality information should evoke peripheral processing. This implies that students should use the heuristic negative cue about the quality of the medium again to arrive at their satisfaction ratings. This should bring about a decrease in these students' satisfaction compared to the students, who based their satisfaction ratings on the instructional medium's objective quality (provided again that the medium can be judged objectively of sufficiently good quality).

Under *low relevance*, peripheral processing should be the main processing mode. Supplying students' with positive vs. negative quality information should result again in a differential effect on their levels of satisfaction with an instructional medium, because now both groups of students should use their respective quality cue to arrive at their satisfaction ratings. Positive quality information should produce higher satisfaction levels compared to negative quality information.

Of course, the outlined predictions will not simply be taken over from the ELM at this point. Beforehand, Chapter 5 will provide a thorough comparison of the ELM's central theoretical constructs and the theoretical constructs suggested by the preliminary intrapersonal model to be

involved in the generation of quality information effects in self-regulated learning (see Section 3.2.3).

5. Transforming the ELM into a Model of Quality Information Effects

To ensure the adequacy of applying the ELM to explain quality information effects in self-regulated learning, the important constructs pinpointed within the ELM will be discussed in terms of their relation to the concepts outlined within the preliminary intrapersonal explanation of such effects (see Section 3.2.3) and vice versa (Section 5.1). In this discussion other research from the area of learning and motivation will be considered where necessary. Doing so will result in the integration of the ELM-derived predictions (see Section 4.3) with the preliminary intrapersonal explanation, applying comprehensive adaptations and extensions to both of these frameworks. Ultimately, this will lead to the proposition of a final model specifically tailored to quality information effects in self-regulated learning: the Quality Information Impact Model (QIIM) (Section 5.2).

5.1 A Comparison of Theoretical Constructs

The preliminary intrapersonal model suggested in Section 3.2.3 and the ELM-derived predictions described in Section 4.3 entailed some variables that—at least at first sight—seemed very similar. However, each of these models also encompassed factors that clearly did not appear in the other one. Thus, fathoming the following central constructs in detail appears indispensable: quality expectations, heuristic cues, content relevance, cognitive effort, cognitive processing strategies and last, but not least, knowledge acquisition and attitude formation.

5.1.1 Quality Expectations

The preliminary intrapersonal explanation presented in Section 3.2.3 assumed that students would generate expectations about the quality of an instructional medium on the basis of respective quality cues. Further it was claimed that these expectations would affect students' cognitive processing and, thus, their final learning outcomes. Similarly, the main

assumption underlying research on SFP effects in teacher-student interaction is that giving certain cues to teachers or students about their own or the other party's competence will lead—under certain conditions determined by the individual characteristics of students and teachers as well as the situational specificities—to the generation of particular expectations (see Chapter 2). In fact, as stated in the definition of SFP effects at the very beginning of this dissertation, the generation of expectations represents the core essence of any SFP effect. For a model of SFP effects based on quality information about an instructional medium, it seems therefore mandatory to include the formation of quality expectations about an instructional medium as the first causal step. Although the authors of the ELM have so far not discussed the role of expectancies within their particular framework, other researchers working in the area of attitude formation have suggested that cues about the competence of an information source can trigger respective expectations (e.g., Chaiken, Wood & Eagly, 1996; Chen & Chaiken, 1999).

In view of this state of research, the QIIM will suggest students' quality expectations about an instructional medium as the first mediating variable involved in quality information effects on students' self-regulated learning outcomes. This assumption represents the first major extension of the ELM-derived predictions to fit with the findings from research on SFP effects in education. With students' quality expectations occupying this central role, the crucial question now is in what way they can be differentiated from other significant expectations students hold: that is, students' self-efficacy expectations. These expectations have been already identified as determinants of students' self-regulated learning outcomes (see Section 3.1 for details). Within a particular self-regulated learning task (e.g., studying a journal article), a student's self-efficacy expectation will entail whether or not he/she believes in his/her capabilities to execute a specific set of behaviours required to complete this task successfully (e.g., identifying the main theoretical argument or understanding the experimental design used). In contrast, expectations

about the quality of an instructional medium concern whether or not a student thinks that one can ever realise a successful learning outcome with this particular instructional medium, irrespective of one's individual capabilities.

In his Social Cognitive Theory, Bandura (1977b; 1986; 1989) has actually drawn a seemingly similar distinction between self-efficacy expectations and outcome expectations (see Figure 5.1). As he specified in one of his earliest writings (Bandura, 1977b, p. 193) “an outcome expectancy is defined as a person's estimate that a given behaviour will lead to certain outcomes. An efficacy expectation is the conviction that one can successfully execute the behaviour to produce those outcomes.”. Moreover, although Bandura generally holds that the outcomes people expect are mostly determined by their self-efficacy perceptions, in one of his later papers (Bandura, 1989, p. 1180) he explained: “Expected outcomes contribute to motivation independently of self-efficacy beliefs when outcomes are not completely controlled by quality of performance. This occurs when extraneous factors also affect outcomes.”

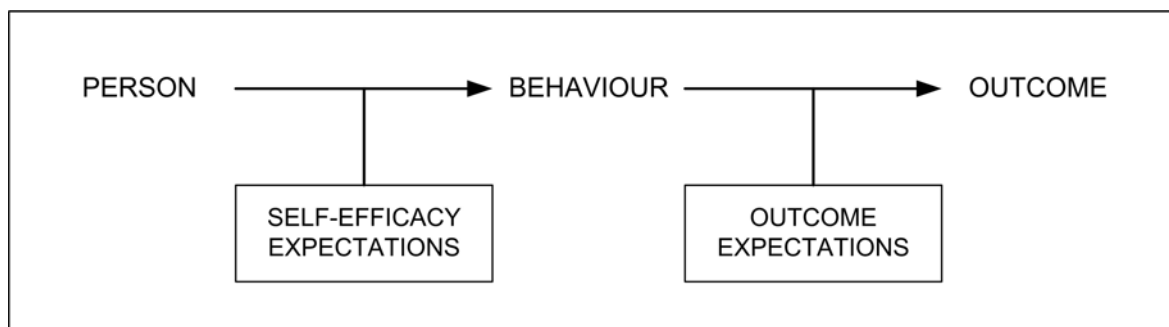


Figure 5.1

Representation of the difference between self-efficacy expectations and outcome expectations according to Bandura (1977b)

In the area of self-regulated learning, empirical evidence on the power of outcome expectations is found wanting. However, evidence on the effect of outcome expectations has been obtained in other domains, such as for example in the area of behavioural trainings (e.g., Maddux, Norton & Stoltenberg, 1986; Maddux & Rogers, 1983; Maddux, Sherer & Rogers, 1982). Including both a manipulation of participants' expectations about the effectiveness of a particular behavioural technique to reach a

particular outcome as well as participants' self-efficacy expectations to execute this behaviour, only participants' outcome expectations were found to determine their behavioural intentions to use this technique in the future significantly. Inducing high outcome expectations resulted in greater intentions to perform the behavioural technique than evoking low outcome expectations.

Reaching a successful outcome in self-regulated learning also strongly depends on a pivotal extraneous factor: the instructional medium and its quality. If a student does not consider a specific instructional medium as high in quality, he/she will not think that studying with it will lead to a successful achievement outcome. Vice versa, if the student thinks that the medium is high in quality, he/she will expect that studying with it will lead to a high achievement outcome. Thus, the student's quality expectation about the instructional medium can be understood as a particular type of outcome expectation. This also relates to students' expectations regarding their teachers' competence in teacher-regulated learning, since the teacher represents a crucial extraneous determinant of the students' learning outcomes.

So far, no specific hints at the moderating conditions involved in the generation of students' quality expectations about an instructional medium have been found. Unfortunately, research on the moderating conditions for the development of outcome expectations is also lacking. Yet, as will be elaborated in the following, the ELM appears able to make some important suggestions about two potential situational moderating conditions so far not considered. These moderators are heuristic cues other than explicit quality information. In this way, the ELM will once more further the extension of the preliminary intrapersonal explanation of quality information effects in self-regulated learning.

5.1.2 Heuristic Cues

Both the ELM-derived predictions, as well as the preliminary intrapersonal explanation, have defined heuristic cues about the quality of an instructional medium as the starting point of SFP effects in self-regulated learning. Yet, the effect of heuristic cues about the quality of an instructional medium on the generation of respective expectations of the students appears in a twofold way more complex than described so far. First, the complexity is increased by the fact that expectations about the quality of an instructional medium might not only be inferred on the basis of explicit quality information. Rather, such expectations might also be based on more *implicit quality cues*. The second reason for the increased complexity of source characteristic effects in the present scenario is that the information about the quality of an instructional medium itself emerges from a particular information source: *the person giving the quality cues*. The role of implicit quality cues and cue giver characteristics within the effect of explicit quality information about an instructional medium will be discussed forthwith.

One potential implicit quality cue often delivered together with explicit quality information is the information about the *competence of the author* of an instructional medium. For instance, the example concerning the quality information provided by amazon.com about Zimbardo et al.'s (2003) textbook presented at the very beginning (see Section 1.1) also provided information about Zimbardo's presidency of the American Psychological Association, implying a high level of competence. Similarly, within the studies by Fries et al. (in press) the high quality medium was supposed to be authored by the head of the local Department of Computer Science, suggesting a high level of competence (see Section 3.2.4 for details on these studies). The low quality medium, on the other hand, was claimed to be authored by a computer science student, indicating comparatively little author competence. Also, as discussed in Section 3.2.2, other potential implicit quality cues might be, for example, the country of origin of the instructional medium or the accent of the speaker

within a computer-based training. As was explained in Section 3.2.3, such implicit quality information might, similar to explicit quality information, evoke respective quality expectations in the students. In other words, information about a highly competent author might result in more positive quality expectations, compared to information about an author with little competence. As will be specified next with the example of information about the author's competence level, implicit quality information may also exert a moderating function for the effect of explicit quality information on students' quality expectations.

Whether an interaction between explicit and implicit quality information will occur, seems to depend on the cognitive integration of these two pieces of information by the students (e.g., Anderson, 1974). On the one hand, a highly competent author might be less readily expected to produce an instructional medium of low quality compared to an author who is suggested to have little competence. Similarly, an author who is attributed little competence might be less readily expected to realise an instructional medium of high quality, compared to an author who ostensibly possesses a high level of competence. Thus, even if the effect of explicit quality information would be limited at both levels of author competence (high vs. low), no interaction would become established between explicit and implicit quality information. Rather, both factors would exert an independent effect on students' quality expectations (see Figure 5.2, left hand graph). In algebraic terms this would imply an additive integration of explicit and implicit quality information.

On the other hand, it seems plausible that information about an author with little competence might completely inhibit the development of positive quality expectations on the basis of respective explicit quality information, because people would simply not expect a low competence author to produce a high quality instructional medium at all. In algebraic terms this would indicate that a multiplicative integration of the two pieces of information has occurred. In this case an ordinal interaction between explicit quality information (positive vs. negative) and implicit quality

information (high vs. low author competence) would become manifest (see Figure 5.2, right hand graph).

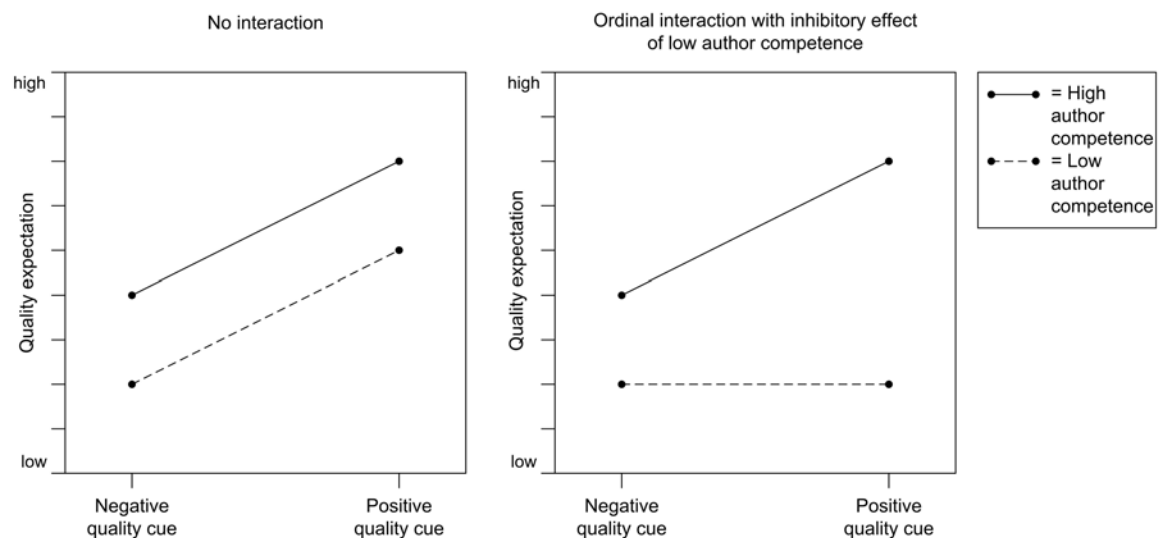


Figure 5.2

Two alternative hypotheses on the interaction effect of explicit and implicit quality information (i.e., author competence) on the generation of students' quality expectations

The second reason for the increased complexity of source characteristics effects in the present scenario is that the information about the quality of an instructional medium itself emerges from a particular information source: *the person giving the quality cues*. The characteristics of this secondary information source might impact additionally on the effect of the explicit quality information given about the primary information source, the instructional medium. This issue seems not only important for quality information effects in self-regulated learning, but also for research on expectancy effects in general: If the cue giver is not perceived as competent for giving this particular information, no expectations might become generated. Indeed, in one of his earliest discussions of the generation of self-efficacy expectations and their effects, Bandura already remarked (1977b, p. 202):

“The impact of verbal persuasion on self-efficacy may vary substantially depending on the perceived credibility of the persuaders, their prestige, trustworthiness, expertise, and assuredness...The influence of credibility on attitudinal change has, of course, received intensive study. But its effects on perceived self-efficacy remain to be investigated.”.

Although three decades have almost passed, research on this issue is still lacking, both for research on self-efficacy expectation effects particularly and SFP effects generally. If successful, the investigation of the moderating effect of the cue giver's competence on the effects of quality information about an instructional medium can be seen as an important contribution from attitude research to research on expectancy effects.

Although sound empirical evidence is missing, varied anecdotal evidence in research on SFP effects in education, supports the importance of the level of competence attributed to the information source from which the expectancy-inducing information originated. For example, a recent publication by Rosenthal (2002) gives the following details about the procedure taken in his classic study on the Pygmalion effect:

„Lenore also suggested gently that I was „a bit naive“ to think one could just *tell* teachers to expect some of their students to be “diamonds in the rough”. We would have to administer some new test to the children, a test teachers would not know...All of the children in the study were administered a nonverbal test of intelligence, which was disguised as a test that would predict intellectual “bloomings”. The test was labelled the Harvard Test of Inflected Acquisition.” (Rosenthal, 2002, p. 29)

By highlighting that the test stating the actual differences in students' potential was actually generated by the renowned Harvard University, it seems likely that the authors promoted high competence perceptions of the expectancy-inducing source. These high competence perceptions might have facilitated the generation of respective expectations in the teachers. Furthermore, it seems crucial to note that other studies successful in showing SFP effects in teacher-regulated learning adapted the procedure used by Rosenthal and Jacobson. For example Zanna et al. (1975) called their expectancy-inducing scale the “Princeton Academic Potential Inventory”, likewise promoting high source competence perceptions by referring to this renowned institution as the place of production of the test used to determine students' potential.

Similarly within the generation of quality information effects, it might be significant, if an experienced professor with a high level of competence in a

certain subject or an inexperienced student with little competence in this area gives the quality information about an instructional medium. Although this kind of information should not directly impact on students' cognitive processing of the learning content and their learning outcomes (because it does not directly relate to the instructional medium), it might exert an indirect effect. More specifically, the suggested competence of the cue giver might determine to what extent quality expectations will be developed on the basis of the explicit quality information presented. As in the case of information about the author's competence presented above, depending on the way the different pieces of information become cognitively integrated by the students (e.g., Anderson, 1974), two alternative predictions can be made for the interaction of explicit quality information (positive vs. negative) and information about the cue giver's competence level (high vs. low) (see Figure 5.3).

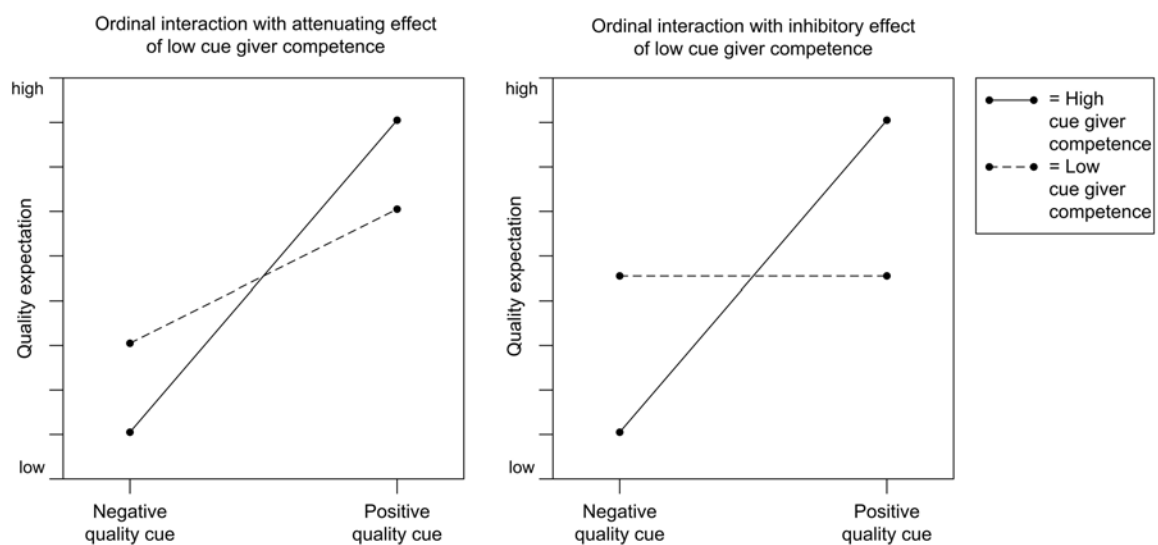


Figure 5.3

Two alternative hypotheses on the interaction effect of explicit quality information and cue giver characteristics (i.e., cue giver competence) on the generation of students' quality expectations

On the one hand, suggesting little competence of the cue giver supplying quality information could result in the attenuation of the effect of explicit quality information on expectation formation, since people might in this case less readily generate quality expectations from explicit quality information. On the other hand, it seems equally possible that rather than merely weakening the effect of explicit quality cues; the low cue giver

competence information might result in the complete nullification of the explicit quality cue effect. In algebraic terms a multiplicative integration of the different pieces of information must be assumed to have occurred in both of these cases, whereby the difference would lie in the individual weighting of the impact of cue giver competence. Still, in both cases an ordinal interaction of the two factors would be present.

Reiterating, the effect of explicit quality cues about an instructional medium might be influenced by additional implicit quality cues (e.g., the competence of the author of the instructional medium) as well as by *secondary heuristic cues* about the individual characteristics of the *cue giver* (e.g., such as the cue giver's level of competence for giving the explicit quality recommendation). Therefore, implicit quality cues as well as cues about the competence of the cue giver will be included in the QIIM as potential moderating variables of the effect of explicit quality information on students' quality expectations, whereby either attenuating or inhibitory effects are suggested as possible. The inclusion of these moderating variables represents a crucial extension of both the preliminary intrapersonal explanation as well as the ELM-derived predictions for the effects of quality information about an instructional medium. Furthermore, the investigation of the moderating effect of cue giver characteristics on the process of expectation generation could have important implications for research on expectancy effects in other areas than the area of self-regulated learning.

5.1.3 Content Relevance

As described in Section 4.2, the ELM postulates a moderating influence of the relevance of a message's content to the message recipient on the effect of cues about an information source's level of competence. As such, the relevance of a message content is defined by the ELM as the extent to which a person is affected by a particular topic in his/her personal life or as Johnson and Eagly (1989, p. 292) have put it: "...the relevance of an issue to their (the message recipients) currently important goals." The

construct of content relevance has so far not appeared within the outlined research on SFP effects in education.

To further specify the meaning of this construct, it seems useful to describe first the way Petty and his co-workers (e.g., Petty & Cacioppo, 1979; 1984b; Petty, Cacioppo & Goldman, 1981; Petty, Cacioppo & Heesacker, 1981) as well as others (e.g., Burnkrant & Howard, 1984; Sorrentino et al., 1988) have usually manipulated content relevance within their studies on attitude formation. In these studies, content relevance was manipulated by telling one group of students that a curricular change dealt with within a message would be implemented in the very near future at their own university and telling another group that these changes would apply at a different university or at the students' own university, but within a time span not relevant to themselves (e.g., in ten years). Whereas the former information was taken to induce high relevance, the latter was considered to establish low relevance of the message content within the students. Now, the experimental task was to form an attitude concerning the curricular change on the basis of the information provided within the message. Furthermore, in addition to the factor content relevance other variables were manipulated (e.g., source competence) and the interaction between these factors was observed.

As a meta-analysis by Johnson and Eagly (1989) has shown, across the various existing studies the outlined high vs. low relevance manipulation did result in a significant interaction effect between content relevance and source cues on attitude formation. As described by the ELM, under low content relevance, source cues were found to significantly affect the attitudinal outcome (as simple acceptance or rejection cues), but under high content relevance no such effect was identified. Johnson and Eagly's analysis further demonstrated that this kind of content relevance manipulation did not exert a main effect on participants' attitude formation. Furthermore, other studies (see Petty & Cacioppo, 1984a for a summary) have determined that under moderate content relevance (e.g., if a student can not be sure whether or not a curricular change will concern

him/herself), source cues can occupy an additional function: namely, acting as triggers for different cognitive processing modes and, thus, again influencing the attitudinal outcome (for details on the interaction between content relevance and source cues and the cognitive processes involved see Section 4.2).

A concept from research on students' motivation and achievement that appears closely related to this operationalisation of content relevance in attitude research is the utility of a learning task as perceived by the student with respect to his/her personal goals (Eccles et al., 1983; Wigfield & Eccles, 1992; 2000). For example, for a psychology student planning to become a therapist, a statistics exam might have a low utility value. However, for a psychology student planning to stay in research, this exam should have a high utility value. Similarly, the attitude formation task concerning a curricular change outlined above might have had low utility for a student who would have graduated by the time this restructuring was said to apply, but high utility for a student who would still be attending his/her university at this point.

As research in the educational domain by Eccles and Wigfield (1995) has shown, the utility value of a task can be empirically differentiated from two other crucial task values: the attainment value (i.e., how important it is for someone to do well on a task) and the intrinsic interest value (i.e., how much someone enjoys doing a task). Nonetheless, these different task value components are often analysed together. The evidence regarding the effect of these task values on students' learning outcomes is mixed. On the one hand, research by Eccles and her co-workers has established that these task values are well suited to predict students' intentions for future course enrolment and actual course enrolment behaviour, but not students' achievement in these courses (e.g., Eccles & Wigfield, 1995; Meece, Wigfield & Eccles, 1990; Wigfield & Eccles, 2000). On the other hand, a recent study by Simons, Dewitte and Lens (2003) showed an effect of the experimental manipulation of the utility value of a physical task (i.e., dribble-shooting a basketball) on students' learning process and

outcome. Furthermore, these authors explicitly used the term personal relevance of a task as a synonym for utility value of a task. Plus, in their study a very similar experimental manipulation to the one used by the ELM authors to vary participants' content relevance was employed: Participants were told that the physical task to be performed (i.e., playing basketball) would either be only needed within the particular experimental context at the time (i.e., low relevance) or that the task would also be important for students in the future, since it would represent a good way of keeping fit (i.e., high relevance)¹⁸. Those students who had received the high relevance information (compared to the ones who had received the low relevance information) benefited significantly in terms of their motivation (i.e., higher task- and lower ego-orientation, higher intrinsic motivation, enjoyment, effort and time on task) as well as in their final performance outcome.

To sum up, comparing the definition of a task's utility value/relevance for students in the context of academic achievement with the definition of the relevance of a message content for the recipient in the context of attitude formation, the two constructs appear essentially similar. However, within the area of attitude formation, the personal relevance of a message's content to the recipient is noted for exerting only a moderating function for the effect of source cues on the attitudinal outcome, but no main effect (Johnson & Eagly, 1989). As outlined above, within educational research at least some evidence exists that the relevance of a learning task to the students might also have a main effect on students' learning outcomes. A moderating function of the personal relevance of a learning task for the effect of students' expectations, or the effect of the expectancy-inducing

¹⁸ Simons et al. (2003) also realised a third relevance condition, in which they stressed both that the task would be personally beneficial and that participants would be required to perform it at a later point in time in another experimental context. Adding this external argument concerning the task utility showed corruption effects on students' motivation and performance, yet students under this condition still exceeded the students, who had been told that the task was relevant only for the present experimental context. However, this further discrimination is not important for the current research issue and, thus, will not be discussed further.

cues, so far has not been demonstrated. Still, with the similarity in definition and the present focus on identifying potential moderators, it seems reasonable to explore the role of a learning content's relevance for the effect of quality cues about an instructional medium on students' self-regulated learning outcomes.

Consequently, the individual student characteristic *content relevance* will be included in the QIIM as a potential moderator, impacting on the effect of students' quality expectations on students' cognitive processing and final learning outcomes. As outlined in detail in Section 4.3, under low levels of content relevance cognitive processing should be predetermined at the shallow/peripheral level and, thus, quality information and respective expectations should not impact on students' achievement. Yet quality information and respective expectations should still impact on students' final satisfaction ratings with the instructional medium, since the application of shallow/peripheral processing is suggested to entail the use of this information as a simple heuristic cue to arrive at such ratings. Under moderate levels of content relevance, quality information and respective expectations should guide the initiation of a particular cognitive processing mode (i.e., shallow/peripheral vs. deep/central processing) and, hence, affect both students' satisfaction and achievement. Under high content relevance, no influence of quality information and respective expectations should occur, since content relevance should again predetermine the cognitive processing mode (i.e., deep/central processing). Following from deep/central processing, both students' achievement and satisfaction ratings should be a function of the objective quality of the instructional medium.

On the basis of the available evidence outlined above, it is not clear whether content relevance would impact on students' achievement as a main effect. Thus, no specific hypothesis will be stated with regard to the main effect of content relevance on this dependent variable. For the attitude-related outcome variable satisfaction with the instructional medium, no main effect of content relevance should appear, since no such

effect has been identified by past research on attitude formation. The inclusion of these predictions represents an important ELM-based extension of the preliminary intrapersonal explanation of the quality information effect in self-regulated learning.

5.1.4 Cognitive Processing Strategies

Besides students' quality expectations, students' cognitive processing has also been suggested to be involved in the mediation of an effect of quality information about an instructional medium. On a general level, students' cognitive processing has been designated as the total amount of cognitive effort invested into the learning task. On a specific level, students' cognitive processing has been defined as the particular processing strategy applied by the student to the learning content. Whereas the construct of cognitive effort will be explored in the next section (Section 5.1.5), the current focus will be on cognitive processing strategies.

Within the preliminary intrapersonal explanation as well as within the ELM-derived predictions a significant differentiation has been drawn between two types of cognitive processing strategies: *deep* and *shallow*, or respectively, in ELM terms, *central* and *peripheral processing strategies*. The mediational function proposed were as follows: Positive quality information—or rather students' respective positive quality expectations developed on the basis of this information—should result in students' increased deep/central processing compared to negative quality information and respectively negative quality expectations. Conversely, the latter quality information and students' respective quality expectations should trigger more shallow/peripheral processing compared to positive quality information and respectively positive quality expectations. Ultimately, these different processing strategy patterns should bring about a divergence in students' learning outcomes, whereby the outcome generated through deep/central processing is expected to supersede the outcome produced by shallow/peripheral processing.

Now, the ELM-derived predictions additionally state that the described quality information effect should only occur under moderate, but not under high or low content relevance (for details see Section 5.1.3). Irrespective of the quality information provided about the instructional medium to be used, under a high level of content relevance deep/central processing should predominate students' cognitive processing strategies. Conversely, at a low level of content relevance shallow/peripheral processing should be the prevailing processing mode, independent of the quality information supplied. To judge the adequacy of equating the processing strategies defined by the ELM with the processing strategies students' use during studying, let's have a closer look at the cognitive processing strategies operating during learning and compare them with the cognitive processing strategies applied within attitude formation.

In the accounts on which the preliminary intrapersonal explanation was based (e.g., Alvarez-Torres et al., 2001; Mayer et al., 2003; Salomon, 1984), the two different processing modes operating to realise an SFP effect on the basis of students' expectations about an instructional medium were only vaguely specified. One mode was pinpointed as involving deeper, and the other as encompassing shallower, elaboration processes. However, within the last decades an impressive number of researchers attempting to elucidate what students' actually do when they study have similarly specified two distinct processing modes taken by students across different learning tasks, now speaking of deep and surface learning strategies (e.g., Biggs, 1979; 1989; 1993; Entwistle, 1988; Entwistle, Hanley & Hounsell, 1979; Entwistle & Ramsden, 1983; Entwistle & Waterston, 1988; Marton & Saljö, 1976a; 1976b; 1984; Pintrich & Garcia, 1991; Pintrich, et al., 1993; Ramsden & Entwistle, 1981; Schmeck, 1988). Generally, deep learning strategies have been defined as strategies aiming at the thorough understanding of a learning content. Surface strategies have been defined as strategies aiming at the verbal reproduction of a learning content, without a comprehensive understanding of its meaning.

The empirical evidence on the effect of deep and surface strategies on students' achievement is mixed. A range of qualitative laboratory studies (e.g., Entwistle & Marton, 1994; Marton & Saljö, 1976a; Van Rossum & Schenk, 1984) seems to support the superiority of deep compared to surface learning strategies. Yet, as Wild (2000) has already noted, the interpretation of these findings must be treated with some caution, because of various methodological weaknesses inherent in these studies. However, a recent field study by Creß and Friedrich (2000) also demonstrated that students who predominantly rely on surface learning strategies cannot live up to the level of achievement reached by those students mainly using deep learning strategies. The results of a field study by Pintrich et al. (1993), as well as one of the studies using the PISA data (Artelt, Demmrich & Baumert, 2001), went along similar lines. In these studies, positive correlations appeared between the use of deep learning strategies and achievement, but not for the application of surface strategies and achievement. However, another field study by Pintrich and Garcia (1991) identified both a positive correlation between surface strategies and achievement ($r = .31$) and deep strategies and achievement ($r = .30$). Therefore, it was suggested that both types of strategies can equally benefit students' achievement. Furthermore, a study by Schiefele et al. (1995) found only a moderate correlation ($r = .21$) and a study by Baumert (1993) no correlation ($r = .04$) between deep learning strategies and students' achievement. Explanations for these inconsistencies will be discussed forthwith.

A first explanation for the lack of relation between students' use of learning strategies and their final achievement might be provided with a critique put forward by Krapp (1993). Krapp emphasised that the self-report instruments used to measure students' learning strategies were rather global in nature, using statements such as "During studying, I always try to put the learning content into my own words.". He thus recommended refining the operationalisation of learning strategies. More specifically, he suggested framing self-report statements on a more

specific situational level, referring to the particular learning task at hand. In this way, the predictive validity of measures regarding students' use of different learning strategies could be improved.

A related explanation is contained in the work of Artelt (1999; 2000), who attributed the lack of relation between students' learning strategies and students' achievement in some studies to the self-report measures used. Instead of this kind of assessment, Artelt advocated the use of behavioural measures. In a field study with students from grade four to eight, Artelt (2000) applied such a behavioural measurement technique in addition to a self-report measure. Doing so, she was able to show that a significant but only small relation ($r = .16$) existed between the self-reported deep learning strategy use and the corresponding behavioural measure and no significant relation occurred at all between students' self-report of their use of surface learning strategies and the respective behavioural measure. On the basis of these results, Artelt concluded that at least younger students might experience difficulties in adequately reporting on their use of learning strategies, affecting also the relation occurring between such subjective measures and students' final learning outcomes. With the behavioural measure of students' learning strategies, Artelt (1999) was able to demonstrate a strong relationship between students' deep strategy use and their final achievement outcome ($r = .37$).

In view of the inconsistent findings concerning the relation between students' deep or surface learning strategies and their final achievement, researchers have also emphasised that the relationship between these types of learning strategies and the final outcomes strongly depends on the nature of the learning task (e.g., Entwistle & Entwistle, 1991; Krapp, 1993; Wild, 1996). To get a better understanding of the effect of deep and surface learning strategies on students' achievement in dependence of the individual task characteristics, a closer look at the definitions of the different types of cognitive learning strategies is required. Here, the focus

will be on one particular approach to students' learning strategies, namely the approach by Pintrich and his co-workers¹⁹. This will also provide the ground for discussing the relation of deep and surface cognitive learning strategies to the two levels of cognitive processing defined by the ELM.

Pintrich and his associates (e.g., Pintrich, 1989; Pintrich & Garcia, 1991; Pintrich et al. 1993) differentiate between two deep (i.e., elaboration and organisation) and one surface cognitive processing strategy (i.e., rehearsal)²⁰, which are specified as follows. The use of elaboration implies that students seek to find connections between the various aspects contained within a new learning content and also compare the new information with already existing relevant knowledge. This encompasses for example the reformulation of the learning content in their own words, the generation of analogies or the search for practical examples from their own everyday experience. Organisation strategies involve thinking about the structure of the newly presented knowledge as a whole and reorganising it to facilitate comprehension. To do this, students might identify the main facts or lines of argumentation or generate different kinds of summarising graphical illustrations (e.g., mind maps). Whereas elaboration strategies promote students' achievement mainly in terms of knowledge construction in working memory as well as knowledge integration into long-term memory, organisation strategies—besides furthering knowledge construction and integration—in addition also affect

¹⁹ The approach adopted by Pintrich and his co-workers (see for example Pintrich et al., 1993) clearly differentiates cognitive factors involved in students' studying from motivational factors. In contrast, the remaining approaches advocate an inherent link between intrinsic motivation and the use of deep learning strategies and between extrinsic motivation and the use of surface learning strategies (see for example Biggs, 1979; Ramsden & Entwistle, 1981; Schmeck, 1988). Thus, their definitions of deep and surface learning strategies also encompass motivational aspects. As current research does not support the usefulness of merging cognitive and motivational factors involved in students' learning (see Wild, 2000 for a detailed review), for the current purpose the approach by Pintrich and his co-workers was focused on.

²⁰ The most recent version of the Motivated Strategies for Learning Questionnaire (Pintrich et al., 1993) also includes a third deep cognitive learning strategy, critical thinking, which has not been included in the current empirical investigations and, therefore, will not be further discussed.

the initial selection of information to be transferred into working memory (Weinstein & Mayer, 1986; Wild & Schiefele, 1993).

Comparing the outlined deep learning strategies with the central processing strategies defined within the ELM, important similarities emerge. First, the definition of elaboration learning strategies presented above matches very well the ELM definition of central processing as thoughtful content-focused analysis of the message on the basis of relevant prior knowledge. Further support for the congruence of central processing and elaboration strategies is provided with the finding that attitudes based on central processing are more stable compared to attitudes based on peripheral processing and the explanation put forward for this result: Central processing promotes the integration of information into long-term memory (Petty, Haugtvedt & Smith 1995). Still, reorganising an attitudinal message so far has not been mentioned as a processing strategy by researchers on attitude formation. However, this might also be a result of their methodology, since the message contents used are usually rather short. This might make the use of organisational strategies irrelevant.

Now, rehearsal strategies have been defined as entailing the repetition of individual facts as well as more complex issues in order to learn them by heart. In contrast to the two deep learning strategies elaboration and organisation, rehearsal strategies only aim at reproduction and not at the comprehension and understanding of a new learning content. The main function of rehearsal strategies has been described as lying in the selection of new information and encoding it into working memory (Weinstein & Mayer, 1986; Wild & Schiefele, 1993). This accounts for the results presented above, which stated that surface strategies lead to decreased learning achievement when compared to deep strategies. Nevertheless, this surface strategy is also content-focused and is particularly important at the first stages of knowledge acquisition i.e., when important information becomes identified and chosen for assimilation into short-term memory. This explains why for certain tasks

(e.g., reading a text about a new concept domain or learning a new language) rehearsal strategies can also appear beneficial for students' achievement and why the use of deep strategies is often observed to run in parallel to the use of surface strategies (e.g., Ainley, 1993; Artelt, Demmrich & Baumert, 2001). Therefore, rehearsal strategies appear quite different to the peripheral strategies defined by the ELM, namely the exclusive use of heuristic cues to generate an attitude about a particular issue and not a message's actual content.

To summarise, although deep strategies and central strategies appear to share important features, the difference in the meaning of surface and peripheral strategies clarifies that the processing strategies described by educational researchers and the processing strategies defined by attitude researchers do not represent completely congruent constructs. To acknowledge the difference between central/peripheral and deep/surface strategies, they are not going to be collapsed within the final model, but retained as distinct constructs. To facilitate their differentiation, central and peripheral strategies will be referred to as evaluation strategies from now on. Still, there is one important reason, why it seems justified to assume that the predictions made by the ELM for the role of central processing strategies in attitude formation might also apply to deep learning strategies: the similarity of these different kinds of strategies for their respective processing outcomes. Deep learning strategies benefit the encoding and storage of new information in long-term memory and, hence, lead to increased learning achievement. Central evaluation strategies similarly further the encoding and storage of new information in long-term memory. In this way they support the formation of more stable attitudes.

However, the research reviewed gives no hint that the ELM's predictions for peripheral strategies might also hold for surface learning strategies, the two constructs sharing no apparent commonalities. Although the evidence on students' learning strategies implies the superiority of a predominant use of deep strategies compared to a predominant use of surface strategies, unlike the ELM-based predictions, the studies available

also suggest that these different processing modes and their impact might frequently co-occur. Strictly speaking, on the basis of the current state of research it seems unlikely that a beneficial effect of positive quality information about an instructional medium on students' learning strategies should preclude the use of surface strategies; or the effect of this type of strategies on students' achievement. Therefore, the ELM-derived prediction that positive quality information should result in a decrease of surface strategies compared to negative quality information will not be subsumed into the QIIM. Nonetheless, the effect of quality information on students' surface strategies will be investigated in an explorative manner.

The final predictions concerning the role of learning strategies included in the QIIM are as follows. In dependence on the relevance of the learning content (see Section 5.1.3 for details), positive quality information and respective positive quality expectations will increase students' use of deep learning strategies and their use of central content-focused evaluation strategies. Negative quality information and respective negative quality expectations will decrease students' use of deep learning strategies, but increase their use of peripheral cue-based evaluation strategies. Of course, one significant precondition here is that the learning content in focus must require the use of deep strategies. For example, an English vocabulary-learning task would not seem appropriate, since it can be successfully solved solely on the basis of the use of rehearsal strategies. The QIIM's acknowledgement of the differences between learning and evaluation strategies becomes also apparent in the fact that the two different kinds of strategies are assumed to lead to different individual outcomes. The differences in evaluation strategies should ultimately result in higher satisfaction ratings of the instructional medium for the positive compared to the negative quality information condition. The differences in students' deep learning strategies should finally result in an increase in achievement or knowledge acquisition for the positive compared to the negative quality information condition. Before we turn to the discussion of

these different outcomes and their relation, the general cognitive processing factor suggested, students' cognitive effort investment, needs to be analysed in more detail.

5.1.5 Cognitive Effort

In research on students' motivation and academic achievement as well as in research on attitude formation, cognitive effort has been defined as the amount of information processing resources allocated to a specific task (e.g., Salomon, 1984; Cacioppo, Petty, Kao & Rodriguez, 1986). Both the preliminary intrapersonal explanation as well as the ELM-derived predictions advocated students' cognitive effort investment during studying with an instructional medium as an important mediator of the effect of quality cues in self-regulated learning: Students should spend more cognitive effort with an instructional medium regarded as high in quality compared to an instructional medium perceived as low in quality. Furthermore, this rise in cognitive effort expenditure was predicted to benefit students' final outcomes.

Overall, the findings generated by research on academic achievement confirmed the beneficial effect of cognitive effort investment on students' outcomes. For example, a study conducted by Volet (1997) revealed effort as making a unique contribution to the prediction of students' course work performance as well as their final grade (i.e., 21% and 15%, respectively), whereby students' prior performance and age were also included in the analyses. Similarly, Grabe's (1982) field study identified students' effort as a significant predictor of students' final course grade. Again, effort significantly augmented the contribution of a priori differences in students' aptitude by 16%, the two variables overall accounting for 43% of the variance in students' final achievement. Furthermore, VandeWalle, Cron and Slocum (2001)—also using a university course as their testing ground—showed that the amount of students' effort significantly mediated the effect of different types of goal-orientations (i.e., learning, approaching and avoiding goal orientation) on

performance. Likewise, a study by Schiefele, Wild and Winteler (1995) revealed students' effort as significant mediator, transmitting the influence of subject-related interest on final academic achievement over a two years period. Similarly, other studies (e.g., Boekaerts & Otten, 1993; Volet, 1997) have suggested students' effort investment as an important mediator of the effect of students' action control on their final learning outcomes.

In most of these studies, the assessment of cognitive effort strongly resembled the measurement procedure taken by Salomon (1984) in his study on the effect of students' perceptions about instructional media on their learning processes and outcomes (for details of Salomon's study and its relevance to the present inquiry see Section 3.2.1). More specifically, participants were usually asked directly about the cognitive effort they had spent on a particular task (Boekaerts & Otten, 1993; Pokay & Blumenfeld, 1990; Schiefele et al., 1995; Volet, 1997; VandeWalle et al., 2001). Doing so seems a valid method, since—as Gopher and Braune (1984) have established—people can introspect on their cognitive processes and give quantitative information concerning their cognitive effort investment, which is related positively to the objective tasks demands across a great range of tasks (e.g., perceptual motor control tasks, short-term memory tasks or verbal/spatial ability task). Attitude researchers (e.g., Cacioppo, Petty, Kao & Rodriguez, 1986) have applied similar subjective quantitative measures, although their focus was on the amount of cognitive effort participants had expended for the formation of an attitude.

A different measurement approach was applied by Grabe (1982) in his study on the effect of students' effort on their learning outcomes within a university seminar. Grabe used behavioural measures to assess students' effort investment. Over the course of the seminar, he subjected students at various times to individual performance assessments, whilst providing them the option to retake these assessments. Forming an aggregated score of students' retake behaviour, Grabe created an overall index of students'

effort investment. It must be noted that this operationalisation might not be appropriate for encapsulating the construct of cognitive effort, however. Rather it might be taken as a measure of how persistent students behave within a particular learning situation. As such, persistence commonly is defined as the length at which students occupy themselves with a certain task (Atkinson, 1974; Carroll, 1973; 1985; Rheinberg, 1996). Besides assessing the amount of time, studies investigating the role of students' persistence for their learning outcomes (e.g., Vollmeyer & Rheinberg, 2000) have used very similar measurement procedures (i.e., counting the number of trials students performed within a computer-based simulation system on biological processes) to the one used in Grabe's study.

Recapitulating, the ELM-derived predictions and the preliminary intrapersonal explanation have determined cognitive effort as a significant mediator of the effect of medium-oriented quality information on students' self-regulated learning outcomes. As outlined, ample evidence exists that students' effort investment significantly affects students' achievement and can carry important mediating functions for the effect of various motivational determinants of students' achievement. On the basis of this empirical status quo, students' cognitive effort will be included within the QIIM as a mediator of quality information effects, impacted upon by the preceding mediator quality expectations. Similar to students' evaluation and learning strategies and in contrast to students' quality expectations, cognitive effort can be seen as the covert behavioural outcome of the quality information provided to students, ultimately inducing overt behavioural outcomes: students' achievement scores and satisfaction ratings of the instructional medium. Furthermore, following the distinction drawn between evaluation strategies and learning strategies (see Section 5.1.4), it seems necessary to differentiate cognitive effort invested into learning with an instructional medium from cognitive effort invested into the evaluation of this medium. Whereas the former will determine the knowledge-related outcome achievement, the other will impact upon the attitude-related outcome satisfaction. Next, a final

comparative discussion of these different outcomes and their relation to the attitudinal outcomes investigated by researchers on attitude formation ensues.

5.1.6 Knowledge Acquisition and Attitude Formation

The most obvious difference between the constructs dealt with within the ELM and the preliminary intrapersonal explanation of a quality information effect seems to lie within the final outcome focused on. Whereas the ELM focuses on the effect of cues about an information source's characteristics (e.g., level of competence) on the generation of attitudes, the latter focuses on the effect of quality cues about an instructional medium on learning or, more specifically, the acquisition of new knowledge. However, as will be elaborated in the following, the two constructs of attitudes and knowledge inhere important similarities in terms of their cognitive structure and its respective function. On the basis of these similarities, it will be argued that applying the ELM to the present educational scenario is legitimate. To arrive at this conclusion, first a closer look at the definitions of attitude and knowledge is needed.

Attitudes have been generally defined as summary evaluations of objects, issues, other people or oneself, often represented on a positive-negative continuum (e.g., Bohnet & Wänke, 2002, Eagly & Chaiken, 1993; Petty & Cacioppo, 1986a; 1986c; 1996). For instance, a person might love or hate a specific kind of food (e.g., liquorice) or a particular soccer team (e.g., Bayern-München) or favour or oppose certain environmental (e.g., nuclear power plants) as well as socio-political issues (e.g., abortion). Thus, attitudes are commonly measured on a dimensional scale ranging from approval to disapproval, such as like-dislike, favour-oppose or good-bad (e.g., Bohnet & Wänke, 2002; Himmelfarb, 1993).

On the other hand, knowledge has been defined as the result of an enduring change within the cognitive memory system, involving either the development of a new, or the modification of an existing cognitive

structure and can induce further behavioural changes (e.g., Mandl, Friedrich & Hron, 1988; Schiefele & Heinen, 2001; Schnotz, 1994). In research on academic achievement, such changes in knowledge structures most commonly have been assessed via various kinds of questions with different levels of complexity (e.g., open questions or multiple choice questions), asking the student to explicate the relevant information (Kintsch, 1996).

The first apparent similarity between attitude formation and knowledge acquisition is that both processes are firmly grounded in experience (see Bohner and Wänke (2002) for a nature-nurture debate concerning attitudes and Anderson (1989) for a discussion on the origins of human knowledge). Furthermore, similar to knowledge acquisition, attitudes can impact on behaviour (e.g., Bohner and Wänke, 2002; Eagly & Chaiken, 1993; Petty, Haugtvedt & Smith, 1995). Next, more detailed descriptions of the knowledge structures generated during learning and attitudes as summary evaluations will be given. From these, further important similarities between attitude formation and knowledge acquisition will emerge.

The most basic knowledge structures, which have been described are propositional representations (Anderson, 1983; 1990; Norman & Rumelhart, 1975). As Anderson (1990, p. 123) specified “a proposition is the smallest unit of knowledge that can stand as a separate assertion; that is, the smallest unit about which it makes sense to make the judgment true or false.” Examples of such propositions are “Roses are red.”, “The earth circulates the sun.” or “Paris is the capital of France.”²¹. Furthermore, according to these various authors, propositions are combined to form more complex associative and hierarchically structured

²¹ It is important to note that propositions include information about the meaning and not details of wording or syntax and, thus, must be understood only as language-like, representing conceptual objects and their relation in an abstract format without being specific to any language or sensory modality (i.e., touch, vision, olfaction or audition) (Eysenck & Keane, 1996).

mental networks. A vital characteristic of such propositional networks is their internal coherence (Schnotz, 1994).

Moreover, propositions can be integrated with other mental representations, such as spatial images and linear orderings in larger knowledge structures called schemas²² (Anderson, 1983; 1990; Anderson & Pearson, 1984; Anderson, Pichert & Shirey, 1983; Rumelhart & Norman, 1978; 1988, Rumelhart, 1984). As Anderson (1990, p. 134) explains "...whereas propositions can represent what is important about specific things, schemas can represent what specific things have in common.". For example, we might have a schema of squares, summarising the typical properties of such geometric figures: namely all parallelograms with (1) four equal sides and (2) four 90-degree angles. This schema of squares might encompass several associated individual propositional statements as well as a corresponding spatial image. Besides their representational function, schemas affect the information processing occurring during learning in a threefold way. First, they influence the initial interpretation of a learning event and by doing so guide attention and influence information encoding. Second, they facilitate the integration of information into an existing schema by promoting information elaboration. Third, they also promote the retrieval of information by providing mnemonic cues for reconstruction.

Now, turning to the more detailed definitions of researchers who have taken on a cognitive perspective on attitudes²³, an important similarity

²² Furthermore and in accordance with Anderson (e.g., 1983), it can be noted that the kind of knowledge represented in propositional networks or schemas is declarative in nature (i.e., "knowing that"). Such declarative knowledge is the basis from which procedural knowledge (i.e., "knowing how to") emerges, which also is represented in memory, yet in another format called production systems (see, for example, Anderson, 1983). However, since the focus of the current investigation will be on the acquisition of declarative knowledge, the discussion will refrain from further specifying procedural knowledge and its cognitive representation.

²³ As is commonly acknowledged, the area of attitude research is dominated by a great variety and heterogeneity of perspectives taken on the nature, structure and function of attitudes. This seems to be taken as a positive surplus by various eminent researchers in this field. For example, Eagly and Chaiken (1984, p. 269) advocated that "...the multiplicity of viewpoints...is a sign of vigorous intellectual health.". Similarly, McGuire

appears between attitude formation and knowledge acquisition. As such, these researchers have defined attitudes as cognitive structures represented in memory in a fashion closely resembling the outlined representation of knowledge (e.g., Pratkanis & Greenwald, 1989; Pratkanis, 1989). More specifically, attitudes are taken as being represented in memory by (1) an object label, (2) the summary evaluation of that object and (3) a knowledge structure to back up this evaluation. Such attitudinal associative networks are also proposed to possess schematic functions. Moreover, as other authors have stressed (e.g., Judd & Lusk, 1984; Lusk & Judd, 1988), such attitudinal cognitive structures can also vary in terms of complexity and coherence.

However, a distinction might be drawn with respect to what has been referred to as knowledge structures in such attitudinal networks and the knowledge structure outlined earlier. As Eagly and Chaiken (1993) have stated, attitudinal knowledge structures involve various individual beliefs people hold with respect to an attitudinal object. For example, a person might have different individual beliefs towards nuclear power plants, such as “Nuclear power plants do not cause any dangerous nuclear contamination.” as well as “Nuclear power plants are cheap to maintain.”, overall resulting in a positive summary evaluation, or in other words, a positive attitude towards nuclear power plants. Although such beliefs can also be represented in a propositional format (Fishbein & Ajzen, 1975), as will be clarified immediately, some differences exist in comparison to the knowledge structures acquired during learning.

(1969, p. 265) demanded: “Let a hundred flowers blossom, let a hundred schools of thought contend.”. For the current discussion this meant that priorities clearly needed to be set and no comprehensive account of all the existing views on attitudes could be given. The focus was placed on cognitive accounts of attitudes, since these most clearly demonstrated the commonalities between the two constructs attitudes and knowledge. However, at this point it should be noted that other researchers do not adhere to this cognitive view on attitudes, instead emphasising either the affective dimension of attitudes (e.g., Zajonc, 1980; Chaiken, Wood & Eagly, 1996) or the situational and temporary construction of attitudes (e.g., Wilson & Hodges, 1992), to name just two different emphases.

Individual beliefs—and thus ultimately attitudes—are often rather subjective representations of the world. In comparison, knowledge structures acquired through learning (e.g., Paris is the capital of France) can be taken as rather objective factual representations of the world (Southerland, Sinatra & Matthews, 2001). In line with this, students have been found to hold different epistemic standards for their knowledge and their beliefs; in other words students vary in the degree to which they judge items supposed to represent belief or knowledge propositions as correct (Sinatra, Reynolds & Jacobson, 2003). Furthermore, as Sinatra et al. (2003) also showed, students use different epistemological warrants to support their knowledge propositions (i.e., academic sources) and their belief propositions (i.e., non-academic sources). This finding corresponds with the view of most educational psychologists that beliefs or attitudes are derived mainly on the basis of everyday experience, whereas knowledge is to a large extent acquired as a result of formal learning in educational contexts (e.g., Alexander & Dochy, 1995).

To sum up, attitudes acquired on the basis of persuasive communication in various contexts and knowledge acquired in the process of education share a similar cognitive structure as well as its function. Yet, they have been acquired in different experiential contexts and differ in their degree of objectivity²⁴. More specifically, knowledge acquisition and attitude formation both include the development and modification of associative propositional networks exerting schematic functions. In view of these relations, it seems justified to assume the transferability of the ELM to the present situation. Furthermore, the second outcome variable, students' satisfaction with an instructional medium, included in the QIIM in addition to the students' achievement, can be taken as a very closely related construct to the construct of attitude. As outlined already in Section 4.3, satisfaction has been similarly specified as an evaluative

²⁴ It must further be noted that individual beliefs can also play a very important role within different knowledge areas (see for example Furnham, 1988). Vice versa attitudes can also be based on factual knowledge. Thus, these two conceptual realms quite often even converge and distinguishing them clearly from each other might often be difficult.

response, whereby the focus is particularly on the outcomes of one's own experience with a particular object, person or life domain (e.g., Westbrook & Oliver, 1981). The more positive the evaluation of the experienced outcomes is, the higher the level of satisfaction. The next section will provide a final summary of the QIIM's predictions.

5.2 The Quality Information Impact Model (QIIM): A Summary Overview

The last section presented a comparative discussion of the central concepts contained in the preliminary intrapersonal explanation (for details see Section 3.2) and the ELM-derived predictions (for details see Sections 4.2 and 4.3) for the effect of quality information about an instructional medium in self-regulated learning. This has led to several adaptations and extensions of these explanatory frameworks. First, two additional potential moderators of the effect of quality information on students' quality expectations (i.e., implicit quality information and cue giver characteristics) have been introduced. Second, a differentiation between learning and evaluation strategies as well as cognitive effort invested into learning and cognitive effort invested into evaluation has been proposed. Still, the final model reincorporates two of the most essential ideas of the ELM: the crucial moderating role of the personal relevance of the content at issue for the effect of heuristic cues about an information source and its mediation via differences in cognitive processing. From research on SFP phenomena the most essential features retained are the centrality of expectations as the primary mediator of the effect of heuristic cues about the quality of an instructional medium and the focus on students' achievement outcome and satisfaction ratings. Figure 5.4 represents a summary overview of the final model. In the following a detailed description of the QIIM's major assumptions entailed in Figure 5.4 will be given.

The first main assumption of the QIIM is that explicit or implicit positive quality cues should lead to positive quality expectations and, respectively, explicit or implicit negative quality information should bring about

negative quality expectations. Furthermore, the effect of explicit quality cues on students' quality expectations is said to be attenuated or even inhibited by implicit negative quality cues (i.e., information about low author competence) and negative information about the characteristics of the cue giver (i.e., information about low cue giver competence). Vice versa, the effect of explicit quality information on students' quality expectations is assumed either to be only activated under the condition of high cue giver competence and high author competence or this effect might be further strengthened at these levels. The alternative predictions about the effects of the individual levels of the potential moderators cue giver and author competence are specified in Figure 5.4 with the grey arrows pointing from cue giver competence and author competence onto the black arrows leading from explicit quality information to students' expectations.

The second central assumption of the QIIM is that the developed quality expectations should further impact on students' cognitive processing, with positive expectations increasing the cognitive effort expended into learning and evaluation as well as resulting in a higher use of deep learning and central evaluation strategies compared to negative expectations. Negative quality expectations in comparison to positive quality expectations should decrease the cognitive effort expenditure as well as the use of deep learning strategies, whilst promoting the application of peripheral evaluation strategies.

Ultimately, these differences in effort investment as well as learning and evaluation strategies should provoke differences in students' achievement and satisfaction levels with an instructional medium. As such, high use of deep learning strategies and high effort investment into learning should bring about high achievement scores, whereas, in comparison, low use of deep learning strategies and low effort investment into learning should result in low achievement scores. Similarly, effortful, central evaluation

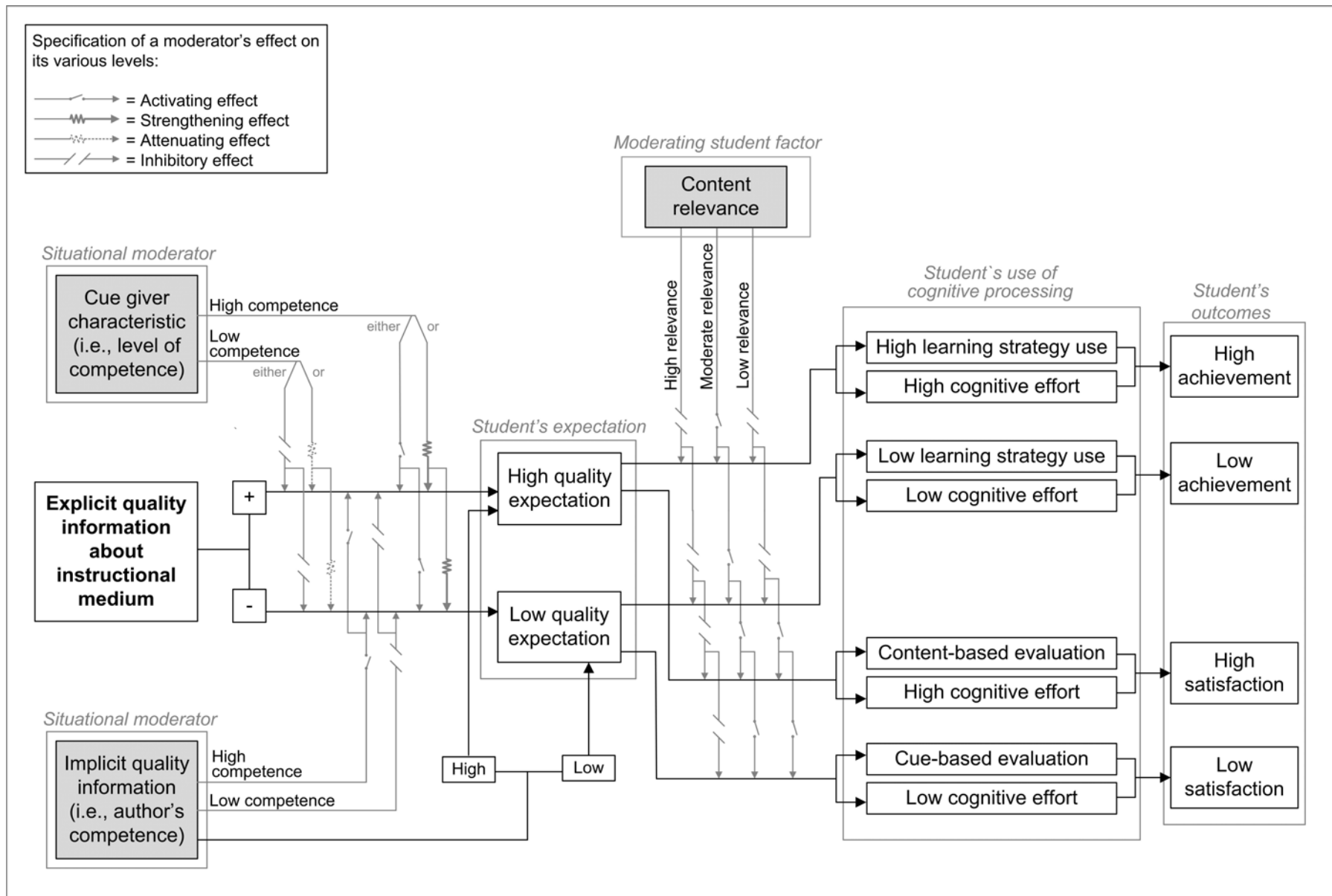


Figure 5.4
The Quality Information Impact Model (QIIM)

strategies should result in high satisfaction ratings, while effortless, peripheral evaluation strategies should ultimately produce relatively low satisfaction ratings.

Most importantly, this effect of quality information and respective quality expectations on students' achievement and satisfaction levels should only arise under the condition of moderate content relevance. Under low content relevance, quality information and respective expectations should impact only on students' satisfaction levels, since here a low use of deep learning strategies should always result in low achievement levels. Yet the predominant use of peripheral cue-based evaluation strategies should take into account the quality information provided (i.e., higher satisfaction following from positive quality information compared to negative quality information). Under high content relevance, quality information should have no impact on the described self-regulated learning processes and outcomes, since under this condition a high use of deep learning and central evaluation strategies should prevail. These postulated effects of the individual levels of the moderator content relevance are illustrated in Figure 5.4 with the different grey arrows pointing from content relevance onto the black arrows leading from students' expectations to students' cognitive processing and learning outcomes.

In closing the QIIM overview it is also important to highlight two significant underlying premises of the described predictions mentioned already at various points in this discussion. First, the instructional medium's objective quality should be sufficiently high to allow valuable knowledge acquisition. Second, the learning content in focus should require the use of deep learning strategies (e.g., an English vocabulary learning task successfully completed via the exclusive use of surface strategies would be unsuited). Now, after the deduction of this comprehensive theoretical model of quality information effects in self-regulated learning, this model will be put to an empirical test.

PART III: TESTING THE QIIM—THE EXPERIMENTAL SERIES

The main objective of the experimental series conducted was to answer the following question: Can quality information about an instructional medium exert a SFP effect with respect to students' achievement and satisfaction with this medium? The QIIM—the theoretical model detailed in the previous chapter—provided the basis for generating specific predictions about the moderating conditions and the mediating processes involved in the generation of this phenomenon. Overall, four experiments were realised to test these hypotheses empirically. The focus of the first three studies was on the analysis of individual subsections of the QIIM. The last study attempted a complete assessment of the QIIM. The experimental self-regulated learning scenarios entailed the use of both a traditional instructional medium (i.e., a printed text) and what one might call a new instructional medium (i.e., a computer-based hypertext). In this way, the generalisability of the generated results for different types of instructional media was ensured. Table 5.1 offers an overview of each experiment's individual focus, design, setting and sample.

Experiment 1 ($N = 131$) used a *within-subjects* design to test the first essential causal sequence suggested by the QIIM: the generation of students' expectations regarding the quality of an instructional medium on the basis of explicit quality information about this medium. In addition, the moderating roles of implicit quality information (i.e., information about the author's competence) and information about important characteristics of the person handing out the quality information (i.e., information about the cue giver's competence) were assessed. More specifically, students had to indicate their quality expectations about different fictitious web-based training programmes described to them. Beforehand students had received individual quality recommendations about each of these instructional media. These recommendations varied systematically not only with respect to the

Table III.1
Overview of the experimental series

	Experimental Focus	Experimental Setting	Independent Factors		Dependent Factors
Experiment 1 Within-ss N = 131	The effect of explicit quality information about an instructional medium on students' quality expectations and the moderating role of implicit quality information (i.e., author competence) and cue giver characteristics (i.e., cue giver competence).	Students state their quality expectations for different web-based training programmes after having received written quality recommendations for each programme.	V	1. Explicit quality information: - Instructional medium high in quality - Instructional medium low in quality 2. Implicit quality information: - Author of instructional medium with high competence - Author of instructional medium with little competence 3. Characteristics of cue giver: - Cue giver with high competence - Cue giver with little competence	O 1. Quality expectations
Experiment 2 Between-ss N = 38	The effect of explicit quality information about an instructional medium on self-regulated learning processes and outcomes.	Students study with a printed text suggested to be part of the primary reference textbook within a course on key skills development.	V	1. Explicit quality information: - Instructional medium high in quality - Instructional medium low in quality	O 1. Satisfaction 2. Achievement
			C	1. Content relevance: Moderate 2. Cue giver competence: High 3. Author competence: High	M 1. Quality expectations
Experiment 3 Between-ss N = 100	The effect of explicit quality information about an instructional medium on self-regulated learning processes and outcomes and the moderating role of the relevance of the learning content to the students.	Students study with a printed text suggested to be part of the primary reference textbook within a course on key skills development.	V	1. Explicit quality information: - Instructional medium high in quality - Instructional medium low in quality 2. Content relevance: - Low - Moderate	O 1. Satisfaction 2. Achievement
			C	1. Cue giver competence: High 2. Author competence: High	M 1. Quality expectations
Experiment 4 Between-ss N = 199	The effect of explicit quality information about an instructional medium on self-regulated learning processes and outcomes and the moderating role of content relevance and cue giver competence.	Students study with a hypertext suggested to be part of a web-based training programme, forming the primary reference source within a course on key skills development.	V	1. Explicit quality information: - Instructional medium high in quality - Instructional medium low in quality 2. Content relevance: - Low - Moderate - High 3. Characteristics of cue giver: - Cue giver with high competence - Cue giver with little competence	O 1. Satisfaction 2. Achievement
			C	1. Author competence: High	M 1. Quality expectations 2. Learning strategies 3. Cognitive effort

V = variation; C = constant; O = outcome; M = mediator

explicit (i.e., positive vs. negative quality) and implicit quality information (i.e., high vs. low author competence), but also in terms of the information supplied about the level of competence of the person providing the individual recommendation (i.e., high vs. low cue giver competence). The experimental hypotheses (see Section 5.1.2 in particular) predicted that explicit, as well as implicit, positive quality cues would raise students' quality expectations compared to respective negative information. Furthermore, the effect of explicit quality information was expected to be diminished or even eliminated when considered with a low level of both moderating factors: low competence of the author of the instructional medium and low competence of the cue giver.

Having examined the role of these three factors for the generation of quality expectations, the second experiment ($N = 38$) went on to assess the effect of explicit quality information on students' actual learning outcomes. More specifically, the focus shifted onto the effect of explicit quality information (positive vs. negative) about an instructional medium (i.e., a printed text) on students' achievement and satisfaction with this medium given moderate content relevance. This was the relevance condition suggested by the QIIM to promote the occurrence of these quality information effects. The design used in Experiment 2 was *between-subjects*, with quality information as independent and content relevance as constant variable. Implicit quality information (i.e., author competence information) and information about the competence of the person giving the explicit and implicit quality cues were also held constant at a high level.

With these situational and individual moderating conditions, the following predictions are made by the QIIM for the effect of explicit quality information. Explicit positive quality information should lead to higher achievement and greater satisfaction levels than explicit negative quality information. Furthermore, students' quality expectations are assumed to exert a mediating function for these explicit quality information effects. First, explicit positive quality information (compared to explicit negative

quality information) should lead to higher quality expectations. This should, in turn, elevate students' achievement and satisfaction ratings. Although these essential predictions were aimed to be tested, Experiment 2 was also a general test of the experimental scenario to be used in the subsequent experiments (Experiment 3 and 4). This explains why it was conducted on a rather small scale level in terms of sample size.

The experimental task used in Experiment 2 required students to study an excerpt from a textbook on efficient studying skills (Hülshoff & Kaldewey, 1993). The text was introduced to students as the main instructional medium to be used within a course unit on key skills development. It was further suggested that this course unit would become obligatory for the students at an unspecific later point in time in the course of their study programme. This information aimed at keeping students' perceived relevance of the presented learning content at a moderate level. Before actually starting to study with the text, half of the participants were supplied with explicit positive quality information about the text, the other half with respective negative information. The same experimental scenario was used in the third and fourth experiment. Yet the focus was expanded to include the variation of the relevance of the learning content to the students and the manipulation of the cue giver's competence level. In addition, the role of students' cognitive processing in the mediation of the effect of explicit quality information on students' achievement was targeted.

Using again a *between-subjects* design, Experiment 3 ($N = 100$) investigated the effect of manipulating explicit quality information (i.e., positive vs. negative) under two different conditions of content relevance (i.e., low vs. moderate). Students had to study the same text as in Experiment 2, but half of them had received explicit positive and the other half explicit negative quality information about it beforehand. The variation of content relevance was realised at the very beginning of the experimental session. Half of the students were told that the text would be used in a course on key skills development, which would become

obligatory at a different university (i.e., the University of Hannover) from the next semester onwards. This represented the low relevance condition. The other half was told that this course would become obligatory at their home university (i.e., the University of Mannheim), but at a point in time not yet specified. This made up the moderate relevance condition.

According to the QIIM (see Section 5.1.3 in particular), the following outcomes were expected. Under low content relevance no effect of quality information should occur on students' achievement. Under moderate content relevance explicit positive quality information should result in higher achievement than explicit negative quality information. For students' satisfaction with the text no moderating effect of the manipulation of content relevance on the effect of explicit quality information was predicted. Students' satisfaction levels were suggested to be elevated by positive compared to explicit negative quality information about the text independent of the relevance of the learning content to them. In addition, Experiment 3 gauged again whether the predicted mediating function of students' quality expectations for the two different effects of explicit quality information could be confirmed.

Experiment 4 ($N = 199$) aimed at further inquiring into the moderating function of content relevance and cue giver competence for the quality information effect on students' self-regulated learning outcomes. Thus, two further extensions of the design used in Experiment 3 were needed. First, content relevance now included three levels: low, moderate and high content relevance. Second, as within Experiment 1, the competence of the cue giver was manipulated on two levels: high vs. low cue giver competence. To realise the high content relevance condition, students were told that the course on key skills development (in which the instructional medium would be used) would become obligatory for the entire studentship at their home university (i.e., the University of Mannheim) from the next semester onwards. To vary the cue giver competence, students were told that the quality information about the

instructional medium was either given by a person highly experienced or not very experienced in the evaluation of instructional media.

As outlined in detail in Chapter 5 (see particularly Section 5.1.3), the QIIM-derived predictions stated an effect of explicit quality information on achievement only under the condition of moderate and not under low or high content relevance. Regarding these three levels of content relevance, the QIIM also predicted a moderator effect on the effect of explicit quality information on students' satisfaction levels. Explicit quality information should affect students' satisfaction ratings at the low and moderate, but not at the high level of content relevance. For the manipulation of the cue giver competence (see particularly Section 5.1.2), the QIIM and the results of Experiment 1 led to the postulation of an attenuating effect of negative (compared to positive) cue giver competence information on the different effects of explicit quality information. This moderating effect of cue giver competence should only occur at the levels of personal relevance of the learning content to the student, allowing the occurrence of these effects in the first place.

In Experiment 4, the investigation into the mediating processes was also extended. As such, the cognitive processing factors suggested in the QIIM as covert cognitive-behavioural mediators of the effect of quality information on students' achievement (i.e., deep learning strategies and cognitive effort invested into learning) were included additionally to the strictly cognitive mediator quality expectations (for details see particularly Section 5.1.4 and Section 5.1.5). The QIIM predicted that explicit positive quality information and respectively generated positive quality expectations should lead to increased cognitive effort investment and deep learning strategy use compared to explicit negative quality information and respectively developed negative quality expectations. Ultimately, these cognitive processing differences should result in achievement differences: Students having obtained explicit positive quality information should outperform students having received explicit negative quality information.

Last but not least, in Experiment 4, the type of instructional medium was switched. The learning content used in Experiments 2 and 3 was presented to the students in form of a computer-based hypertext and not as a printed text. As outlined above, the rationale behind this change was to allow for the making of a more general statement on the effect of quality information on students' self-regulated learning processes and outcomes across different kinds of instructional media.

On a theoretical level, the results generated by this experimental series will first of all determine the validity of the QIIM's predictions. At the same time, this will determine the applicability of the ELM and its predictions within an educational setting. Furthermore, the findings will also contribute to the currently available research knowledge about the potential of SFP effects in non-interactive instructional settings. Because, so far, research on SFPs in education has predominantly focused on interpersonal mediating pathways, the identification of the intrapersonal mediators operating to realise this kind of SFP effect seems particularly significant. Likewise, the findings should also be of use for the specification of the influence of situational factors in self-regulated learning scenarios. Viewed from a practical perspective, the empirical evidence produced will provide the basis to hand out sound suggestions to instructional practitioners regarding whether, and if so how, quality information about instructional media might represent a simple tool to optimise their students' outcomes.

Next, the four experiments will be presented individually in terms of their particular aims and hypotheses, experimental method and empirical results (Chapters 6-9). The results of each of the experiments will also be discussed separately. The main function of these individual discussions will be to point out the implications of each study's results for the following studies. In this way, the rationale behind the construction of the experimental series should be rendered clear. The concluding chapter of Part III (Chapter 10) will provide an integrative discussion of the results generated across the four experiments, focusing on their general

theoretical and practical implications as well as issues for future research to explore.

6. Experiment 1: The Effect of Explicit and Implicit Quality Information on Expectancy Generation and the Moderating Function of Cue Giver Competence

Aims and hypotheses. The first experiment investigated the impact of explicit quality cues (positive vs. negative) about an instructional medium on the generation of quality expectations. Another target of inquiry was the moderating role of specific implicit quality cues (i.e., information provided about low vs. high competence of the author of the instructional medium) and the suggested competence of the cue giver (low vs. high) for this explicit quality information effect.

On the basis of the QIIM it was hypothesised that explicit positive quality information about an instructional medium should lead to higher quality expectations than explicit negative quality information. Similarly, implicit positive quality information presented via high author competence information should lead to higher quality expectations than respective negative quality information (i.e., low author competence). Regarding the interaction of the effect of explicit and implicit quality cues, two alternative hypotheses were deduced (see Section 5.1.2). Either explicit quality information would appear independent from implicit quality information, or an ordinal interaction would arise. The suggested mechanism underlying such an interaction was that low author competence might completely inhibit the effect of explicit quality information.

Concerning the variation of the cue giver's suggested competence no main effect on students' quality expectations was predicted, since this information does not directly concern the instructional medium (for details see Section 5.1.2). However, an ordinal interaction was expected to occur between this factor and explicit quality information. Again, two alternative hypotheses seemed plausible for the effect of cue giver competence on the effect of explicit quality cues on quality expectations. Negative information about the characteristics of the cue giver (i.e., low cue giver competence)

should either completely inhibit or merely attenuate the effect of explicit quality information on students' quality expectations.

To test these hypotheses, individual recommendations for eight different fictitious computer-based training programmes on the same subject matter (i.e., how to programme web-pages)²⁵ were presented online via the internet. Students had to imagine a hypothetical learning scenario with these different media and indicate their quality expectations for each programme after having read the corresponding descriptions. The recommendations entailed the systematic variation of the information concerning explicit and implicit quality information as well as the cue giver's level of competence.

6.1 Method

Design. The experiment encompassed a within-subject design with three independent factors: explicit quality cues, implicit quality cues (i.e., author's competence level) and secondary heuristic cues concerning one specific cue giver characteristic, namely, the cue giver's level of competence. The dependent factor in focus was students' expectations about the quality of a particular instructional medium (i.e., the different fictitious web-based training programmes). Each of the independent factors was varied on two levels. Participants were presented with eight written quality reviews, where half of these contained explicit positive, and the other half explicit negative, quality information. Likewise, in half of the cases, it was claimed that the programmes were authored by a person high in competence within the field of computer science. In the other half the author was indicated as having little competence in this subject matter. The level of competence of the person actually giving the different quality reviews was varied in a similar manner. In half of the cases the cue giver was suggested to be a person with high competence in the area of

²⁵ The topic of web-page programming was chosen, because it was assumed to be a popular topic and thus would promote participants' feeling of authenticity in the current hypothetical learning scenario.

computer science. In the other half the cue giver was supposed to have little competence in this domain.

Participants. An opportunity sample of 131 participants was recruited via the website of the Department of Educational Psychology at the University of Mannheim²⁶. The experiment was presented online on the same website. All participants stated to have passed the “Allgemeine Hochschulreife” and to occupy student status at the time of the experiment. Their individual enrolment time varied between 1 and 18 semesters, with 6.14 semesters representing the average enrolment time²⁷. 84 of the participants were female and 47 male. Their age range varied from 18 to 43 years, with a mean age of 23.69 years. As an incentive for participation, various prizes (i.e., three times ten Euros and one time 30 Euros) were distributed amongst them by lottery after the entire data collection phase was finished.

Independent factor 1: explicit quality information. The induction of explicit quality information was realised through brief individual quality reviews of the eight fictitious web-based training programmes (i.e., four positive and four negative reviews). The supposed quality criteria were clarity, coherence, comprehensiveness and organisational structure of the different web-based training programmes. Table 6.1 represents an example for each of the four positive and the four explicit negative quality information pieces each of the participants received (see Appendix A for the entire instruction, containing all of the different explicit positive and negative quality information provided)²⁸.

²⁶ Overall 282 participants completed the entire experimental session, out of which only the ones who had indicated that they were currently enrolled within a university programme were considered in order to make the current sample as comparable as possible to the samples to be used in Experiments 2 to 4.

²⁷ Of the total of 131 students, 48 were studying social science, 24 were studying natural science, 13 were studying humanities, eleven were enrolled in some kind of business degree, 17 were studying computer science, nine were studying law, three were doing an arts degree and five were studying some kind of technical engineering. One student did not indicate the subject matter she/he was studying.

²⁸ Originally the entire instruction was of course presented in German and the wording of all of the items as well as the manipulation specified in the following represent only the

Table 6.1

Examples of the explicit positive and the explicit negative quality information provided

Positive	“I expect that students will greatly benefit from this training. It represents the essentials of web-page design and does not contain any distracting superfluous information. Furthermore, it offers a whole range of exercises to apply the newly acquired knowledge and thus to put oneself to the test. Last but not least, the individual sections are all very well structured and clearly written.”
Negative	“I would not recommend this web-based training to students. In my opinion a lot of them would have problems in understanding its content. The writing style is very complicated, a lot of expert jargon is used and no additional help options are available. Thus, I think that rather than motivating students to learn how to programme web-pages, this training might have the adverse effect.”

Independent factor 2: implicit quality information. Before receiving the explicit quality cue, each of the eight programme reviews started by giving an implicit quality cue. This implicit cue was entailed in a brief description of each of the authors of the web-based training programme and their individual level of competence. As such, the author was either introduced as an expert or a novice to the subject matter concerned (i.e., programming web-pages). To signify high level of competence the author’s occupational and academic status (i.e., professor or head of department or both) in a relevant field of knowledge (e.g., computer science or communication science) was specified. To indicate novice status of the author, the author was introduced as a first year student in a relevant subject area (e.g., computer science or communication science). Table 6.2 gives an example of both the four high and the four low author competency descriptions provided within the reviews (see Appendix A for the entire instruction, including all of the different author competence information supplied).

Table 6.2

Examples of the implicit positive and the implicit negative quality information provided

High author competence	“In co-authorship with his team, Professor Dr. Stefan Mainhard, Head of the Department of Computer Science at the University of Leipzig developed this web-based training in order to participate in a competition concerning the “Optimisation of Teaching Software” posted at the University of Leipzig.”
Low author competence	“This web-based training was authored by Jochen Bannet within a seminar on web-page programming. Jochen is a first year student of educational science at the Pedagogical University of Freiburg.”

Independent factor 3: cue giver competence. Before the participants were presented with the explicit quality cue, they received details about the two people who had judged the quality of the instructional media and their level of competence. The level of competence was manipulated in a similar manner to the author’s level of competence, namely by varying the occupational and academic status of the two cue givers (e.g., professor vs. student). Furthermore, the level of cue giver competence was made salient with the suggested amount of relevant experience the cue giver had in judging instructional media (i.e., extensive vs. little). Table 6.3 provides the different cue giver competence information supplied.

Table 6.3

Information provided about high and low cue giver competence

High cue giver competence	“Dr. Jürgen Steinert has been teaching computer science at the University of Tübingen since 1987 and has received in 2001 the teaching award sponsored by the Ministry of Science, Research and Arts to mark out the best teaching efforts in higher education within the county of Baden-Württemberg. For his great instructional effort within the area of computer science, where he delivers scientific-technical knowledge at a didactically high quality level, Dr. Steiner was rewarded with 10.000 Euros. His lectures enjoy great popularity amongst his students and certainly represent a best practice example of how to improve higher education. Now for the commission of “Innovative Research on Studying and Teaching”, Dr. Steiner has himself reviewed the quality of several computer-based training programmes on web-page design.”
Low cue giver competence	“Daniel Reiter is a first year BSc student of Media and Computer Science at the University of Bremen. Within his first semester, Daniel took part in a seminar on “Introduction into the Development of Computer-Based Trainings”, in which he particularly concerned himself with evaluating the quality of computer-based trainings. Rating the quality of several computer-based programmes on web-page design, Daniel was able to gain insight for the development of his own computer-based training module.”

Manipulation checks. To check whether the manipulations of the participants’ competence perceptions regarding the author and the cue giver were successful, participants were supplied with the respective

information again at the end of the experiment. They then had to indicate on a 6-point Likert-scale (ranging from 1 = “do not agree at all” to 6 = “strongly agree”) whether they did agree that the two cue givers were, respectively, highly qualified to judge the web-based training programmes (see Appendix A for details on the wording). Likewise, they had to state on a 6-point Likert-scale (ranging from 1 = “do not agree at all” to 6 = “strongly agree”) whether they attributed a high level of competence to each of the individual authors (see Appendix A for details on the wording used).

Dependent factor: quality expectations. As outlined in more detail in Section 5.1.1, students’ quality expectations about an instructional medium can be defined as a particular type of outcome expectation. As such, if a student does not consider a specific instructional medium as high in quality, he/she will not think that studying with it will lead to a successful achievement outcome. Vice versa, if the student thinks that the medium is high in quality, he/she will expect that studying with it will lead to an equivalently high achievement outcome. Modelling existing self-report measures of participants’ outcome expectations about a specific behavioural training (e.g., Maddux et al., 1986), the three-item scale represented in Table 6.4 was constructed to measure participants’ quality expectations about each of the web-based trainings introduced to them. Participants had to indicate their level of agreement with these statements on a Likert-scale, ranging from 1 = “do not agree at all” to 6 = “strongly agree”. Single item responses were aggregated for each of the eight within-subjects conditions by calculating the mean score across the three items. The reliability of this scale for the eight individual measurement points was acceptable, with Cronbach’s alpha ranging between .68 and .77.

Table 6.4
Quality Expectation Scale

Item 1 (recoded)	“I don’t expect that this web-based training could elevate my competence in web-page programming.”
Item 2	“I think that I could learn a lot about web-page programming with this web-based training.”
Item 3	“I expect this web-based training to be of very high quality.”

Procedure. On the introductory page of the instruction, participants were first acquainted with the purpose of the study. With the systematic within-subjects variation of the three independent factors, the true rationale of the study was judged to be to a fair extent obvious to the participants. Thus an attempt to mislead the participants about the study’s purpose seemed inadequate. Yet the aim of the present inquiry was specified only on a very general level: The study was claimed to concern the effect of different kinds of information about web-based training programmes on people’s expectations. What was not mentioned was that the different web-page programmes were merely fictitious. Besides, the participants were informed about the prizes to be won (i.e., three times ten and one time 50 Euros), supplied with an approximate time frame for completing the experiment (i.e., 25 minutes), assured of their anonymity and asked to provide some general sociodemographic details about themselves (i.e., gender, age, educational status, student status, enrolment time).

In a next step, participants were presented with a hypothetical learning scenario with different web-based trainings on how to programme web-pages and the two quality cue givers, varying in suggested level of competence, were introduced. Afterwards, participants were supplied with the individual reviews of the eight different web-based training programmes. In addition to the explicit and implicit quality information, each programme was specified in a neutral way by supplying an individual title and a brief content overview of the programme. The intention underlying this procedure was to support the participants in creating “a mental picture” of the eight programmes. Close attention was paid to keeping the titles and content information as similar as possible, without

making them sound too repetitive. To control the effect of wording, a computer-controlled randomised combination of the different pieces of information (i.e., title of web-based training, author competence information, content overview, cue giver information and explicit quality cue) into a complete review was realised.

After each programme review, participants had to indicate their quality expectations for the individual programme. Again, the order of the respective items was randomised in each of the eight experimental trials; this time to prevent order effects. After having been presented all programme reviews and having stated their quality expectations, participants had to indicate their competence perceptions for both the individual authors and the two quality cue givers. In this way, the successful manipulation of these independent factors was checked. At the end of the experiment, participants were supplied with a more detailed description of the study's purpose, offered the chance to take part in the lottery of the various prizes (i.e., three times ten and one time 30 Euros) and thanked for their participation. A complete version of the outlined experimental instruction is contained in Appendix A.

Statistical methods. A three-factorial within-subjects ANOVA was applied to analyse whether the experimental manipulations of the explicit and implicit quality cues as well as the information provided about the cue giver's level of competence had the postulated main and interactive effects on the dependent variable quality expectations²⁹. The adapted level of

²⁹ To ensure the applicability of using variance-analytical methods, the dependent variable quality expectations was checked in advance in terms of two preliminary assumptions: normality of its distribution and sphericity (e.g., Bortz, 1993; Field, 2005). With the current design being within-subjects, the distribution of the pairwise differences in quality expectations were calculated for all combinations of the experimental conditions and screened for distribution normality. This involved both the inspection of the graphical representations as well as using the z-transformed skewness and kurtosis values to calculate confidence limits. As this required the conduction of a great number of significance tests, alpha was reduced to .01. The overall result of the screening was that no violations of the assumption of normality were apparent (for all z-values the following applied: $-2.58 < z < 2.58$). Furthermore, the assumption of sphericity did not seem relevant to the current design, since each factor encompassed only two levels and, thus, the comparison of covariance matrices was made redundant.

significance was set at $\alpha = .05$, with two-tailed testing being applied in case of non-directional and one-tailed testing being used for directional hypothesis tests³⁰. The interaction between the different independent factors entailed various alternative hypotheses. Because of this, if an interaction effect was revealed within the three-factorial ANOVA, post-hoc testing procedures were used to further determine the effect of quality information at each level of the moderating factor (Bortz, 1993; Field, 2005). These post-hoc tests entailed separate one-factorial within-subjects ANOVAs with Bonferroni-corrected alpha levels. For all of the tests conducted, effect sizes were additionally calculated to index the amount of variance explained by a specific factor or the interaction of different factors. The effect size measure of choice within analysis of variance (no matter of within- or between-subjects) is partial eta squared or η_p^2 (e.g., Tabachnick & Fidell, 1989)³¹. This test statistic can be classified as follows: a value of .01 is considered as a small, a value of .06 is taken as a moderate and a value of .14 is recognised as a strong effect (Cohen, 1988; Stevens, 1996). All of the statistical analyses described were conducted using the statistical software package SPSS (Version 11.5).

6.2 Results

Manipulation checks. To ensure that the experimental manipulations had had the intended effects on participants' perceptions, the data obtained with the two treatment checks were analysed first. Two individually conducted one-factorial within-subjects ANOVAs revealed for both of these treatment checks significant group differences (cue giver competence: $F [1, 130] = 19.37$; $p < .001$ [one-tailed]; $\eta_p^2 = .13$; author competence: $F [1,$

³⁰ Note that if ANOVA is used with two-level factors, it is algebraically equivalent to a two-tailed t -test. Hence, in case of a directional hypothesis, it is legitimate to conduct a one-tailed test. For an in-depth discussion on why the ANOVA F is a one-tailed non-directional test, which p -values can be adapted to in case of directional testing please refer to Ley (1979).

³¹ As Tabachnick and Fidell (1989) explain, in contrast to another effect size measure—eta squared—commonly reported in the context of analyses of variance, partial eta squared (the authors' only call it the alternative eta squared) has the advantage of not being dependent on the magnitude of other effects contained within a design.

130] = 33.83; $p < .001$ [one-tailed]; $\eta_p^2 = .21$). Participants indeed had judged the authors suggested as experts significantly higher in their levels of competence compared to the authors introduced as novices in the relevant subject area ($M = 4.34$ [$SD = 0.85$] vs. $M = 3.77$ [$SD = 0.92$], respectively). Likewise, participants had rated the cue giver allegedly being an expert significantly higher in competence than the one described as a novice ($M = 4.78$ [$SD = 0.96$] vs. $M = 4.19$ [$SD = 1.39$], respectively).

Effects of explicit quality information, implicit quality information and cue giver competence. To test whether the experimental manipulations had the postulated effects on participants' quality expectations a three-factorial within-subjects ANOVA was computed. It revealed a main significant effect for both the explicit ($F [1, 130] = 275.88$; $p < .001$ [one-tailed]; $\eta_p^2 = .68$) and the implicit quality information ($F [1, 130] = 16.31$; $p < .001$ [one-tailed]; $\eta_p^2 = .11$), but no significant interaction between these factors. As can be seen in Table 6.5, the data showed that participants generated higher quality expectations for the web-based trainings that were presented with explicit positive quality information compared to the ones presented with explicit negative quality information. As also displayed in Table 6.5, quality expectations were likewise more positive when the web-based training was supposedly authored by an expert (= high author competence) than by a lay person (= low author competence). However, such implicit quality information did not have a moderating influence on the effect of explicit quality information: The differences between the two explicit quality information groups were equal in size and direction across the two levels of author competence.

Table 6.5

Quality expectations under different conditions of explicit and implicit quality cues

	High author competence			Low author competence			Overall		
Explicit quality information	<i>M</i>	<i>SD</i>	<i>N</i>	<i>M</i>	<i>SD</i>	<i>N</i>	<i>M</i>	<i>SD</i>	<i>N</i>
Positive	4.64	0.80	131	4.46	0.83	131	4.55	0.75	131
Negative	3.14	0.85	131	2.94	0.83	131	3.04	0.72	131
Overall	3.89	0.61	131	3.70	0.56	131			

Furthermore, the results of the ANOVA showed that the factor cue giver competence had significantly interacted with the factor explicit quality information ($F [1, 130] = 6.45$; $p < .05$; $\eta_p^2 = .05$), but not with the factor implicit quality information. Following the significant interaction up with a Bonferroni corrected one-factorial ANOVA (explicit quality information as within-subjects factor) at each of the two levels of cue giver competence revealed a significant main effect in both cases (high competence: $F [1, 130] = 239.24$; $p < .001$ [one-tailed]; $\eta_p^2 = .65$); low competence: $F [1, 130] = 198.99$; $p < .001$; $\eta_p^2 = .60$). As represented by the respective effect sizes as well as the descriptive statistics in Table 6.6, the superiority of the explicit positive quality information group compared to the explicit negative quality information group was somewhat more pronounced, when the explicit quality information was given by a source with high expertise compared to a source with low expertise.

Table 6.6

Quality expectations under different conditions of explicit quality cues and cue giver competence

Explicit quality information	High cue giver competence			Low cue giver competence			Overall		
	<i>M</i>	<i>SD</i>	<i>N</i>	<i>M</i>	<i>SD</i>	<i>N</i>	<i>M</i>	<i>SD</i>	<i>N</i>
Positive	4.65	0.79	131	4.45	0.80	131	4.55	0.75	131
Negative	3.02	0.84	131	3.05	0.83	131	3.04	0.72	131
Overall	3.84	0.55	131	3.76	0.59	131			

6.3 Discussion

As the analysis above showed, both explicit and implicit quality cues exerted the expected effect on participants' quality expectations. Explicit positive quality information, as well as suggesting a high level of competence for the author of an instructional medium, resulted in higher quality expectations than the respective negative information (i.e., explicit negative quality information and low author competence information). The size of the effect of explicit quality information was strong. The size of the effect of implicit quality information was moderate. Furthermore, the effects of the different kinds of quality information appeared to be

independent of each other. The differences in quality expectations across the group of students having received explicit positive and the group who had been given explicit negative quality information were equally large at both levels of author competence. The only difference was that in the case of low author competence being suggested, the quality expectations of the explicit quality information comparison groups sank at a lower level than in the case of high author competence. These results are completely in line with the first alternative experimental hypothesis (see Section 5.1.2 for details). This means that the second alternative hypothesis—suggesting an ordinal interaction due to an inhibitory effect of low author competence on the effect of explicit quality information—needs to be rejected.

Similarly, with respect to the two alternative hypotheses concerning the interaction between explicit quality information and the suggested level of competence of the cue giver, the first alternative experimental hypothesis can be retained and the second alternative experimental hypothesis can be rejected (see again Section 5.1.2 for details): Low cue giver competence did not inhibit, but only attenuated the effect of explicit quality information on quality expectation formation. The effect size of this interaction approached the moderate range.

To summarise, the first experiment brought support for the first central assumption of the QIIM: Explicit quality information about an instructional medium affects the generation of quality expectations, with positive information resulting in more positive expectations than negative information. Also, the QIIM's assumption that the strength of this explicit quality information effect becomes moderated through the suggested level of competence of the person providing this information was validated. The moderating function of implicit quality information supplied with information about the level of competence attributed to the author of an instructional medium was not confirmed. Still, in accordance with the QIIM, an independent effect of implicit quality information similar to the explicit quality information effect was found, although the respective effect

size indicated a somewhat smaller practical significance of the implicit quality information effect.

In the process of testing the QIIM, the next pressing question arising in view of these findings is: Will the demonstrated effects involved in the generation of quality expectations about an instructional medium further transcend onto students' final learning outcomes as well? Or, more specifically, can explicit quality information initiate a SFP effect for both students' satisfaction and achievement with an instructional medium? Using a real learning situation, Experiment 2, 3 and 4 targeted the assessment of this issue. Their findings will be used to further validate the results obtained in the present experiment, using only a hypothetical learning scenario. The subsequent experiments will also investigate whether or not the relevance of the learning content suggested to the students enacts the postulated moderating function for these SFP effects.

7. Experiment 2: The Effect of Explicit Quality Information on Students' Achievement and Satisfaction under Moderate Content Relevance

Aim and hypotheses. The second experimental study aimed at investigating the impact of explicit quality information about an instructional medium on students' actual achievement and satisfaction with this medium. It is important to point out that this analysis was restricted to one particular level of relevance of the learning content to the students: the moderate relevance level. As outlined in detail in Chapter 5 (see Section 5.1.3 in particular) the QIIM states that only at this level, explicit positive quality information about an instructional medium should result in higher achievement and higher satisfaction of the students with this medium than explicit negative quality information (provided that the instructional medium is objectively of good quality). Thus, in the present experiment the factor content relevance was held constant at a moderate level across the different explicit quality information groups. Furthermore, the level of competence of the author of the instructional medium (i.e., implicit quality information) as well as the suggested level of competence of the cue giver was held constant at a high level. The reason for this was that it seemed to make the learning scenario appear more realistic to the students.

The mediating role of students' quality expectations for the effect of explicit quality information on students' outcomes was also explored. On the basis of the QIIM, as well as the findings made in Experiment 1, the following experimental prediction was stated: The described beneficial effects of explicit positive quality information about an instructional medium on students' achievement and satisfaction with this medium will be mediated via the elevation of students' respective quality expectations.

As already noted in the introduction to Part II, the objective of Experiment 2 included not only the assessment of the predictions made by the QIIM. It also represented a first test of the experimental setting to be used further

within Experiment 3 and 4 (although with some adaptations). In a nutshell, the situation created was as follows. Students had to self-study a printed text. Beforehand, they were given either explicit positive or explicit negative information about the text's quality (together with the information about the high levels of competence of the author and the cue giver as well as the moderate relevance of the learning content). Now not only the experimental manipulation was in need of validation, also the two main dependent measures used (i.e., the achievement and the satisfaction scale) had to be pre-screened in terms of their psychometric quality. Because of this pilot character, the sample size used in Experiment 2 was kept at a small level.

7.1 Method

Design. Experiment 2 encompassed a between-subjects design with one independent factor—explicit quality information—and two dependent factors—students' final satisfaction and achievement with the instructional medium. The independent factor was varied on two levels: explicit positive and explicit negative quality information about the instructional medium. Students' quality expectations about the instructional medium were subsumed additionally as a mediating factor in the design. Furthermore, three constant factors were realised: content relevance, cue giver competence and implicit quality information. The factor content relevance was held constant at the moderate level. The competence of the cue giver and the competence of the author of the instructional medium were each held constant at a high level.

Participants. To ensure the successful manipulation of the participants' perceived relevance of the learning content (for details see the section on content relevance below), only students in the "Grundstudium" period of their programme (i.e., semester one to four) who were not enrolled in a Bachelor programme were recruited from various locations of the Mannheim University campus. In order to prevent students from having detailed preliminary knowledge of the learning content (for details see the

section below on the instructional medium and its content) psychology and sociology students were also not allowed to participate. Taking account of these restrictions, an opportunity sample of 38 students was assembled. As an incentive for participation, students were offered seven Euros. Overall, students' average enrolment time was 2.79 semesters, varying between one and four semesters³². Gender was distributed equally across conditions, with 19 participants being female and 19 male. The age range varied from 19 to 25 years, with a mean age of 22.08 years.

Independent factor: explicit quality information. The explicit quality information about the instructional medium to be used by the students was provided by an expert judgment in a bogus newspaper article, which ostensibly had appeared in a daily newspaper (i.e., Hannoveraner Allgemeine Zeitung). Table 7.1 represents the positive and negative judgment supplied (for the two versions of the complete bogus article see Appendix C).

Table 7.1

Explicit positive and explicit negative quality information about the instructional medium

Positive	"Professor Dr. Gisela Roth at IZH can give us already some first results: "Our evaluation provides a good report for our colleague from Hannover, Dr. Hans Dillenburg. Comparing different texts for a teaching module on studying techniques, his text <i>A Brief Introduction into the Applied Psychology of Learning</i> was pinpointed as didactically particularly recommendable." According to the students, the text was clearly written, well structured, theoretically grounded and very applicable to everyday situations. Besides, students also reached very high achievement scores with this text."
Negative	"Professor Dr. Gisela Roth at IZH can give us already some first results: "Unfortunately, our evaluation does not provide a good report for our colleague from Hannover, Dr. Hans Dillenburg. Comparing different texts for a teaching module on studying techniques, his text <i>A Brief Introduction into the Applied Psychology of Learning</i> was pinpointed as didactically not recommendable." According to the students, the text was badly written, not well structured, overloaded with theory and not applicable to everyday situations. Besides, students also reached only weak achievement scores with this text."

Constant 1: cue giver competence. As can also be seen in Table 7.1, the high level of cue giver competence was implied with a high professional and academic status (i.e., professorship and PhD title).

³² Of the total of 38 students, 28 were studying humanities, 7 were enrolled in some kind of business degree, one was studying computer science and one was studying law.

Constant 2: author competence. As also apparent in Table 7.1, the high level of competence of the author of the instructional medium was indicated through a high academic status (i.e., PhD title).

Constant 3: content relevance. As outlined in detail in Chapter 5 (see Section 5.1.3 in particular), the QIIM defines the perceived relevance of the instructional medium's content by the students as the central moderating variable of the effect of students' quality expectations about an instructional medium (generated on the basis of respective quality information) on their self-regulated learning outcomes. In the present experiment, content relevance was held constant at the moderate level, which is the level postulated to activate the effect of quality information on both students' achievement and satisfaction. In Experiment 3 and 4, a variation of different levels of content relevance was realised (Experiment 3: low vs. moderate relevance; Experiment 4: low vs. moderate vs. high relevance).

To impact on the personal relevance of the learning content to the students, the experimental procedure used by Petty et al. (e.g., 1979; 1981; 1984) to vary participants' personal relevance of an attitudinal issue was adapted. As outlined in detail in Section 5.1.3, Petty and his co-workers commonly informed their participants that their study's purpose was to conduct a survey concerning students' attitudes on specific curricular changes. Furthermore, high content relevance was induced by stating that the changes would immediately apply at the students' own university. Moderate content relevance was created by declaring that the curricular change would apply at the students' home university, but without a specific time frame for this to happen. Low content relevance was established by telling the students that the reformation would take place at a foreign university.

Now the cover story used in Experiments 2 to 4 to determine the level of relevance of the learning content perceived by the students was as follows. The general focus was on a curricular change currently quite commonly

implemented at German universities: the introduction of Bachelor and Master programmes. At the University of Mannheim various Bachelor and Master programmes have recently been established, bringing with them a great amount of curricular restructuring. One example is the various key skills modules (e.g., seminars on various computer software as well as presentation, cooperation and self-organisational skills), which are mandatory for students of these programmes. Plans are currently made to integrate these key skills modules into all studying programmes offered at the University of Mannheim and render them compulsory for the entire studentship.

This situation was used to provide the following cover story to the student participants to manipulate their perceived relevance of the instructional medium's content. All students were told that the textbook with which they would study would become the primary reference source for a particular course on key skills developed to form part of a larger curricular change (i.e., key skills development as compulsory course unit) at a specific university. Now what was manipulated for the different groups of student participants was where, when and for whom this change together with the course and its contents would become obligatory.

In the present experiment, all of the participating students were told that the curricular change would become obligatory at their *home university* for the *entire studentship* at some *unspecific point* in the future. In accordance with Petty and his co-workers this information was assumed to induce *moderate* levels of relevance in these students. The content relevance information was the first information provided within the written instruction (see Appendix B for the complete versions of the experimental instruction). The relevance information reoccurred later in the bogus newspaper articles (see Appendix C for the two newspaper article versions).

In Experiment 3 and 4, two additional levels of suggested content relevance were realised to vary students' perceived relevance of the

learning content presented. In Experiment 3, for a second group of students *low* content relevance was sought to be induced by stating that the curricular change together with the new course modules would be made obligatory for the *entire studentship of another university* from the *next semester onwards*. In Experiment 4, for a third group of students, *high* relevance was to be established. They were told that the curricular change and the new course modules would become obligatory from the *next semester onwards* for the *entire studentship* at their *home university*.

To validate the above operationalisation of content relevance, a small pilot study with ten students was conducted to assess how their relevance perceptions of the learning content provided in the new course modules would be affected by the different information provided about where, when and for whom the curricular change would be introduced. Students' responses confirmed the assumed order of the level of perceived content relevance induced.

Manipulation checks. To ensure that the explicit quality information and the information about the relevance of the learning content were noticed by the students, the following manipulation checks were applied. To check the manipulation of quality information, students had to indicate through a multiple-choice item whether they recollected that the given quality information had been positive or negative. Similarly, students had to demonstrate on two further multiple-choice items whether they were able to recollect the location and the time frame for the curricular changes supplied (see Appendix B for details).

Instructional medium. In the present experiment a five-page DIN-A4 excerpt of a chapter on studying strategies—*A Brief Introduction into the Applied Psychology of Learning*—from a book called *Efficient Studying* by Hülshoff and Kaldewey (1993) was used (see Appendix D for the entire excerpt). The chapter focused on the efficient use of studying strategies, using theoretical and empirical findings from psychological research to underpin the usefulness of the recommendations given. The first section

dealt with the implications of research on classical conditioning. The second section focused on the implications of research on operant conditioning and the third section on the implications of research on learning through insight. Five independent experts selected the text out of three possible texts on key skills development and judged it as being high in instructional quality.

Dependent factor 1: satisfaction. Satisfaction measures often include only a simple “very satisfied—very dissatisfied” single item scale. Despite the obvious face validity of this measurement approach, as Westbrook and Oliver (1981, p. 94) have noted, “it is doubtful that the cognitive, evaluative, affective and conative elements of satisfaction can be adequately captured in a single 5- or 7-point “very satisfied—very dissatisfied” rating scale.”. In line with this position, the scale used to gauge participants’ satisfaction with the instructional medium after learning included four items targeting different domains of satisfaction. This scale had already demonstrated good reliability in the studies conducted by Fries et al. (in press) and only required slight adaptation to the present situation. The wording of the four items is presented in Table 7.2. Participants had to indicate their level of agreement with these statements on a six-point Likert scale (ranging from 1 = “do not agree at all” to 6 = “strongly agree“). The scale showed again good reliability, with Cronbach’s alpha lying at .82, after the exclusion of Item 3. For each participant a final satisfaction score was computed, using the mean of the three single item responses.

Table 7.2
Scale measuring students’ satisfaction with the instructional medium

Item 1	“I consider this text as a high quality instructional medium.”
Item 2 (recoded)	“I don’t think this text delivered any relevant knowledge on studying strategies for university or for work.”
Item 3 (recoded)	“In my opinion the text needs to be improved.”
Item 4	“I’d recommend this text to other students.”

Dependent factor 2: achievement. The test used to assess students' achievement entailed various questions relating to the three topics dealt with within the text, that is "classical conditioning", "operant conditioning" and "learning through insight" and their application for efficient self-studying. Four of the questions were presented in multiple-choice format, whereby one correct answer was always presented together with several distractor items. Table 7.3 gives one example item for illustration purposes.

Table 7.3

Example multiple-choice item from the achievement test

Item 3	"In Pawlow's terminology the animal's salivary flow after the ringing of the bell when no food is presented is called:	
	a.) unconditioned reflex	<input type="radio"/>
	b.) conditioned response	<input type="radio"/>
	c.) neutral reflex	<input type="radio"/>

Three further questions were presented in an open-ended format and asked for the three practical applications outlined in the text for each of the theoretical perspectives (to view the entire achievement measure see Appendix B). The answers supplied to the open-ended items were coded by two independent raters, whereby the interrater reliability was high, with Kappa lying at .88³³. The final reliability of the achievement measure appeared adequate, with Cronbach's alpha lying at .77. Overall the potential range of achievement scores was from zero to 13 points, with one point given for each multiple-choice item answered correctly and one point given for each correct application scenario outlined in response to the open-ended questions.

Mediator: quality expectations. To measure students' expectations regarding the quality of the instructional medium an adapted version of the scale used in Experiment 1 was used (see Table 7.4). Again,

³³ For the four responses (out of the total of 342 responses) to the open-ended questions for which the ratings differed between the two raters, agreement was reached on the basis of discussion.

participants had to indicate their level of agreement with the statements presented on a six-point Likert scale (ranging from 1 = “do not agree at all” to 6 = “strongly agree”). With Cronbach’s alpha lying at .79 the overall reliability of the quality expectation scale was satisfactory. Participants’ responses to the three items were aggregated by calculating a mean quality expectation score for each participant.

Table 7.4
Scale measuring students’ quality expectations about the instructional medium

Item 1	“I think that I will learn a lot from studying with this text.”
Item 2	“I think that this text will increase students’ competencies concerning effective studying.”
Item 3	“I expect this text to offer valuable knowledge about effective studying strategies.”

Procedure. After students were recruited from various on-campus locations, they were sent immediately to the on-campus seminar room, in which the experiment was conducted. The experimental sessions took place in larger groups of eight to ten people. On arrival, each student was assigned randomly to one of the two explicit quality information conditions. With the exception of a brief standardised introduction by the experimenter on the purpose of the experiment (i.e., study a text on studying techniques), a brief overview of the procedure (i.e., a short questionnaire introducing the study’s purpose and presenting some preliminary questions followed by the text and a final questionnaire) and the maximum studying time allowed (i.e., 25 minutes), students received all of the important information in the form of written instructions. To assure that the students would take notice of the important pieces of information, within this brief verbal introduction the experimenter also strongly emphasised that the written instructions contained all of the important information and, thus, should be read carefully. Moreover, to prevent students’ from exchanging information of any kind (e.g., about the instruction, the knowledge test) they were seated a considerable distance from each other and were carefully monitored by the experimenter. Also, students were not allowed to ask any questions during the experimental

session, since this might have endangered the successful manipulation of the quality information (e.g., a student asking, why he/she should learn with a text already judged as being of low quality by an expert). To not trigger students' suspicion, the reason given as to why asking questions was not permitted related to the distraction caused to other students, who had already started studying with the text.

Within the instruction, participants were first asked to supply some demographic information (i.e., age, gender, study programme and enrolment time) about themselves (see Appendix B for details on the exact wording). Next, they were informed about the curricular changes concerning the introduction of an obligatory key skills development course unit within the "Hauptstudium" period of all programmes offered at the University of Mannheim (without a specific time frame) and given more details on the purpose of the experiment. They were told that the study was a try-out of a text intended to become the primary reference source for a specific course module on key skills development. Students were also informed that the task required of them was to study with this text. Beyond that, they would receive questions about its contents later, alongside questions about their own quality judgment of the text. Together with this information, the bogus newspaper article was presented to the students. It contained the information about the curricular change as well as either explicit positive or explicit negative quality information about the text. After having read the newspaper article and before actually receiving the text, students had to indicate their own quality expectations regarding the text on the respective scale. Students then received the text for their independent study, whereby the maximum time allowed was 25 minutes. After having finished studying, students were first administered the satisfaction scale and then the achievement measure. The intention behind this was to prevent students' performance on the achievement measure influencing their satisfaction ratings. Finally, students were asked to fill in the manipulation check items to test whether they had indeed taken notice of the content relevance as well as the explicit quality

information provided initially to them. Having finished the final questionnaire students were thanked for their participation, provided with their payment as well as the option to leave their email address to receive information about the details of the experiment. Overall, the approximate length of an entire experimental session ranged between 50 and 65 minutes.

Statistical methods. With students' achievement and satisfaction with an instructional medium representing two completely different constructs³⁴, a separate one-factorial between-subjects ANOVA was computed for each of the outcome variables without adjusting the alpha level (Bortz, 1993). The alpha level set and the effect size measure calculated followed the procedure taken in Experiment 1. In contrast to Experiment 1, quality expectations were now investigated as the potential mediator of the effects of quality information. To test this mediational function, correlational and regression-analytical methods were used, but only if a significant main effect of quality information on the respective outcome variable had been revealed in the preceding analyses of variance (Baron & Kenny, 1986; Kenny, Kashy & Bolger, 1998). This regression-analytical approach also involved testing whether quality information had influenced the mediator quality expectations. This meant that the variance-analytical investigation of the same effect would be redundant and could be spared. The statistical software programme SPSS (Version 11.5) was used to calculate all of these statistical tests³⁵.

³⁴ This difference is most apparent within the different hypotheses for the interaction effect of quality information and personal relevance on students' achievement and on students' satisfaction (for details see Section 4.3 and Section 5.2).

³⁵ To ensure the use of these various statistical tests, two preliminary assumptions needed to be checked: first, the normality of the distribution of the residuals scores within each experimental condition and second, the homogeneity of variance across the experimental conditions (Bortz, 1993; Field, 2005). Similar to Experiment 1, normality of the distribution was examined by screening the graphical representations and calculating confidence limits with both z-transformed skewness and kurtosis indices. The overall result of this screening was that no violation of the normality of the distribution of the residual scores for either of the outcome or mediating variables (quality expectations, achievement and satisfaction) had occurred (for all z-values the following applied: $-1.96 < z < 1.96$). Furthermore, the homogeneity of variance was checked applying three individual Levene's test for each of the outcome and mediating variables. Doing so

7.2 Results

Manipulation checks. To assess whether the experimental factors were manipulated successfully the respective treatment checks were inspected first. Participants' responses suggested that all of them had taken notice of the individual explicit quality information³⁶. Concerning the content relevance manipulation, 32 students had correctly remembered that the curricular change was supposed to apply at the University of Mannheim, but without any particular time frame mentioned. Six students, however, indicated that they thought the course was actually going to run at a foreign university or at the University of Mannheim at a particular time. The students who had misrecalled the content relevance information were excluded from the main analyses (remaining $N = 32$).

Effects of explicit quality information on achievement and satisfaction. To test, if the experimental manipulation had the postulated effects on students' learning outcomes for each of the two dependent variables—satisfaction and achievement with text—a one-factorial between-subjects ANOVA was conducted. For students' achievement, a statistically significant main effect of explicit quality information was established, whereby the size of this effect was moderate ($F [1, 30] = 3.00$; $p < .05$ [one-tailed]; $\eta_p^2 = .09$). The descriptive statistics represented in Table 7.5 showed that students who had received explicit positive quality information performed significantly better on the achievement measure than students who had been given explicit negative quality information. For the variable satisfaction the effect size approached the moderate range; yet this effect failed to reach statistical significance ($F [1, 30] = 1.48$; $p > .05$ [one-tailed]; $\eta_p^2 = .05$). As can be seen in Table 7.5, the direction of the marginal group differences in students'

revealed no violations of the equality of variance for either of these variables (all F s ≤ 0.592).

³⁶ All participants in the explicit positive quality information group recalled that the text was described as highly recommendable/recommendable, whereas all participants in the explicit negative quality information group recalled that the text was described as not optimal/insufficient.

satisfaction levels was similar to the direction of the significant group differences in students' achievement.

Table 7.5

Satisfaction and achievement under different conditions of explicit quality information

	Positive quality information			Negative quality information			Overall		
	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>N</i>
Satisfaction	4.78	0.83	17	4.40	0.95	15	4.60	0.90	32
Achievement	6.47	2.87	17	4.67	3.02	15	5.63	3.03	32

Quality expectations as mediators. Having established that the experimental variation of explicit quality information produced significant differences on students' achievement outcomes, the next question to be answered by the present data analysis was whether or not students' quality expectations exerted the postulated significant mediating role for this effect. For the variable satisfaction, no such mediational analysis was conducted, since here no significant effect of the experimental manipulation could be established. Although the following mediational analysis was based on a series of regression analyses, the descriptive statistics for the variable quality expectations will nevertheless be provided first. The reason for this is to allow the reader a more comprehensive picture of the relation between the experimental factor and this variable. In line with the predictions, the quality expectations expressed by the explicit positive quality information group were higher ($M = 4.37$ [$SD = 0.68$]) than the ones reported in the explicit negative quality information group ($M = 3.24$ [$SD = 0.73$]).

To determine the mediational role of quality expectations for the effect of explicit quality information on achievement three linear regression analyses were required (Baron & Kenny, 1986; see also Kenny, Kashy & Bolger, 1998 for a more recent explication of this approach). The first regression assessed whether the predictor quality information was significantly related to the criterion achievement or, in other words, the significance of the direct path called path *c*. The second regression tested whether the predictor quality information was significantly related to the

mediator quality expectations; the corresponding path is termed path *a*. The third regression tested whether the mediator quality expectations was significantly related to the criterion achievement, even with quality information already included in the regression equation. The path from quality expectations to achievement is called path *b* and the path from quality information to achievement is termed *c*'. The last regression equation allowed the testing of a complete mediation, that is whether the relationship between the predictor quality information and the criterion achievement (path *c*) diminished, if the relationship between the mediator quality expectations and the criterion achievement was included (path *c*'). Table 7.6 shows the intercorrelations between the three variables involved and Table 7.7 summarises the results of the three regression analyses. For the regression analyses the unstandardised regression coefficients (*B*), the standard errors (*SE*), the standardised regression coefficients (β) and the significance levels (*p*) are displayed.

Table 7.6

Intercorrelations (point biserial and product moment, respectively) between quality information (negative = 1 vs. positive = 2), quality expectations and final achievement (N = 32)

Variables	1	2	3
1: Quality information	—		
2: Quality expectations	.638** ^a	—	
3: Achievement	.301* ^a	.377* ^a	—

^a one-tailed testing applied because of directional hypothesis; ***p* < .01, **p* < .05

Table 7.7

Summary results of the mediation analyses

	<i>B</i>	<i>SE (B)</i>	β	<i>p</i>
Path <i>c</i> (QuI → Ach)	1.80	1.04	0.30	<i>p</i> < .05 ^a
Path <i>a</i> (QuI → QuEx)	1.13	0.25	0.64	<i>p</i> < .05 ^a
Path <i>b</i> (QuEx [QuI] → Ach)	1.06	0.75	0.31	<i>p</i> = .09 ^a
Path <i>c</i> ' (QuI [QuEx] → Ach)	0.61	1.33	0.10	n.s.

Note. R^2 = .22 (*p* < .05); ^aone-tailed testing; QuI = Quality Information, QuEx = Quality Expectations, Ach = Achievement; [x] = controlled for *x*.

The first regression analysis (quality information as predictor, achievement as criterion = path c) revealed that quality information significantly predicted students' achievement. R for this regression was significantly different from zero ($F(1, 30) = 3.0, p < .05$ [one-tailed]). Altogether, 9% of the variability of achievement was accounted for by the predictor variable quality information (1 = negative, 2 = positive). Furthermore, the regression weight indicated that increasing quality information by one unit (from negative to positive) increased students' achievement by 1.8 units.

The second regression analysis (quality information as predictor, quality expectations as criterion = path a) showed that quality information significantly predicted students' quality expectations. R for this regression was significantly different from zero ($F(1, 30) = 20.63, p < .001$). Altogether, 41% of the variability of quality expectations was accounted for by the predictor variable quality information (1 = negative, 2 = positive). Furthermore, the regression weight indicated that increasing quality information by one unit (from negative to positive) increased students' quality expectations by 1.13 units.

The third regression analysis demonstrated the following. Including the mediator quality expectations as an additional predictor to quality information showed that these two predictors significantly contributed to the prediction of students' achievement. R for this regression was significantly different from zero ($F(2, 29) = 2.53, p < .05$ [one-tailed]). Altogether, 15% of the variability of achievement was accounted for by the two predictors quality information (1 = negative, 2 = positive) and quality expectations. Furthermore, quality information did not significantly predict students' achievement anymore, when quality expectations were also taken into account (path c'). However, the path coefficient between quality expectations and achievement (path b) failed just about to reach the level of statistical significance ($B = 1.06; p = .09$ [one-tailed]). An additional z -test of this indirect effect revealed similarly only a near

significant result ($z = 1.34$; $p = .09$ [one-tailed]; for details on how to arrive at the z -value of this two-path indirect effect see MacKinnon, Warsi & Dwyer, 1995).

7.3 Discussion

Regarding the pilot character of the present experiment, it seems, first of all, important to note that the outlined results established a good reliability of the scales used to assess students' quality expectations, satisfaction and achievement. Also, it was shown that the initial judgment of the various experts about the text being a good instructional medium was confirmed by students' high total satisfaction ratings of the text across the two experimental groups ($M = 4.59$, range: one to six).

Now most importantly, the results of Experiment 2 empirically validated one of the essential postulates of the QIIM: Explicit quality information about an instructional medium can affect students' achievement and, hence, can trigger a SFP effect in self-regulated learning. As such, students reached significantly higher levels of achievement, if they had initially received explicit positive quality information about the text compared to students' who had received respective negative information. The size of this effect was moderate. Concerning students' satisfaction with the instructional medium, the results showed that the mean satisfaction ratings were numerically higher for students who had been given explicit positive quality information compared to students who had been given respective negative information. However, this difference was statistically not significant. Still it is important to point out that the effect size for these group differences approached the moderate range. This indicated the practical significance of the manipulation of explicit quality information for students' final satisfaction levels. The reason for this discrepancy might be attributed to the sample size underlying the present experiment, which was quite small ($N = 32$).

Furthermore, the series of regression analyses supplied some first empirical support for the assumption that students' quality expectations exert a mediating function for the effect of explicit quality information on students' achievement. The effect of explicit quality information on achievement dissolved when students' quality expectations about the instructional medium were also included in the regression analysis. However, one of the two mediating paths involved in the indirect effect (i.e., the path from quality expectations to achievement) fell slightly short of statistical significance. In other words, although explicit positive quality information significantly increased students' quality expectations, this increment only tendentially brought about an achievement benefit. Similarly, the total indirect effect only showed a tendency to differ significantly from zero. Again, a possible reason for this lack of significance might be the small sample size ($N = 32$).

Overall, the outlined results of Experiment 2 can be judged an encouragement for further investigation of the effect of explicit quality information on students' self-regulated learning processes and outcomes. However, it must be highlighted again at this point that the current design also involved the factor personal relevance of the learning content to the students as a constant, keeping this factor in both experimental groups at a moderate level. According to the QIIM, the generation of a SFP effect on the basis of quality information should only arise under this relevance level, but not under low or high relevance. Thus, the described SFP effect of explicit quality information can not and indeed according to the QIIM should not be generalised to apply under different relevance conditions. Whether the factor content relevance really plays this important moderating function is the central issue to be investigated in the third and fourth experiments³⁷.

³⁷ Similarly, the factors cue giver competence and author competence were kept constant at a high level. However, as demonstrated in Experiment 1, the factor cue giver competence has only an attenuating but not an eliminating moderator effect, whereas the factor author competence has no moderating effect on the quality information effect at all.

Now, in closing of the current discussion, three points for improvement in the following experiment need to be considered. First, during the present experiment's data collection phase many students did feed back that the maximum studying time of 25 minutes had been rather short. This might be the reason for the rather low overall achievement scores reached by the students across the two experimental conditions (i.e., floor effect). To prevent this jeopardy in the following study, the instructional medium's content was somewhat shortened. The second point for improvement concerns the potential effect of participants' demand characteristics. As such, the present experiment did not assess whether the cover story provided appeared authentic and credible to the students. Thus, students might have guessed the true purpose of the study, potentially influencing their performance. To determine whether students actually believed the suggested study purpose, the following experiment implemented a measure of students' suspiciousness. The third and last issue for improvement concerns the manipulation check applied to assess whether students had taken notice of the content relevance information supplied. So far, this treatment check only gauged whether students had been able to recollect the time and location of the curricular change. However, had the relevance information indeed been experimentally manipulated, this measure would have failed to assess whether this manipulation would have had a differential effect on students' relevance perceptions. To make such differential effects transparent, in the following experiment a self-report measure of students' relevance perceptions was administered as a treatment check.

8. Experiment 3: The Moderating Role of Content Relevance for the Effect of Explicit Quality Information

Aims and hypotheses. The third experiment aimed at investigating the moderating role of students' perceived relevance of the learning content for the effect of explicit quality information about an instructional medium on students' self-regulated learning outcomes. Whereas in Experiment 2 this factor was held constant at the moderate relevance level, within the present experiment a second content relevance condition was juxtaposed: namely, low content relevance. As outlined in detail in Chapter 5 (see Section 5.1.3 in particular), the experimental predictions for the effects of explicit quality information under low and moderate content relevance were as follows.

Given moderate content relevance, explicit positive quality information should lead to higher achievement and higher satisfaction with the instructional medium compared to explicit negative quality information. Given low relevance, the described effect of explicit quality information on students' satisfaction with an instructional medium should also arise. However under low content relevance, explicit quality information should have no impact on students' achievement. Therefore, an ordinal interaction between the two independent factors should be found for students' achievement. For students' satisfaction no interaction of the two independent factors should occur. Similar to Experiment 2, Experiment 3 also included the assessment of the predicted mediational function of students' quality expectations for the different effects of explicit quality information on students' learning outcomes. The factors cue giver competence and author competence were again held constant at a high level as this seemed to make the scenario appear more realistic to the students.

8.1 Method

Design. Experiment 3 used a 2x2 between-subjects design, with the first factor—explicit quality information—including again two levels (i.e., positive vs. negative) and the second factor—content relevance—now also encompassing two levels (i.e., low vs. moderate). The factors cue giver competence and author competence were included as constant factors, both stabilised at a high level. The effects of the experimental manipulations were observed with respect to two dependent variables: students' achievement and students' satisfaction with the text. Students' quality expectations were included in the design as a mediating factor.

Participants. For the recruitment of the participants, the same restrictions as in Experiment 2 were applied. With these restrictions, 100 students were recruited at the end of introductory lectures across different departments of the University of Mannheim. Students were offered ten Euros as an incentive for participation. Overall, 35 males and 65 females took part in the experiment. Their age range varied between 18 and 34 years, with a mean age of 21.13 years. Their mean enrolment time was 1.32 semesters, with a minimum of one and a maximum of two semesters³⁸.

Independent factor 1: explicit quality information. Similar to Experiment 2, the variation of explicit positive and explicit negative quality information was realised through an expert judgment presented to the students in a bogus newspaper article, which ostensibly had appeared in a daily newspaper (i.e., Hannoveraner Allgemeine Zeitung), appearing in the region of a different university (i.e., University of Hannover). Appendix F includes the different versions of the bogus newspaper article used in Experiment 3.

³⁸ Of the total of 100 students, 59 were studying humanities, 40 were enrolled in some kind of business degree and one was studying law.

Independent factor 2: content relevance. The present experiment used a similar cover story to Experiment 2. Again, students were asked to study with an excerpt of a textbook suggested to form the primary reference source for a particular module on key skills development. However, only half of the students this time received additionally the information that the entire course unit on key skills development would become obligatory at their home university (i.e., the University of Mannheim). The other half was told that the course module would become compulsory at a different university (i.e., the University of Hannover). The latter information was expected to induce low relevance perceptions in the students. As in Experiment 2, to keep the induced relevance of the information that the curricular changes would be introduced at the participants' home university at a moderate level, no particular time frame when this change would exactly apply was mentioned. The content relevance information was provided initially as the first information students received within the written instruction. To keep the relevance manipulation salient, it was again repeated within the bogus newspaper article (containing also the explicit quality information about the instructional medium to be used) and appeared also on the printed text in form of a hand-written note (see Appendix G). Table 8.1 represents the different relevance information contained in the different versions of the bogus newspaper article (for the relevance information contained in the instructions see Appendix E, including the different versions of the entire experimental instruction).

Table 8.1

Information provided to induce low and moderate content relevance perceptions

Low content relevance	The cooperation project Mannheim-Hannover wants to set up a comprehensive key skills development programme, which will become compulsory at the University of Hannover for students in the main course of their study programme from the onset of the coming Winter semester 2004/5.
Moderate content relevance	The cooperation project Mannheim-Hannover wants to set up a comprehensive key skills development programme, which will become compulsory at the University of Mannheim for students in the main course of their study programme at some point in the future.

Manipulation checks. As in Experiment 2, to ensure that students had taken notice of the varied explicit quality information, participants had to

indicate at the end of the experiment whether they were able to identify the respective information supplied (for details refer to Appendix E, containing the different versions of the entire experimental instruction). Furthermore, the manipulation check for the second independent factor content relevance entailed this time a relevance perceptions self-report scale. It was administered right after the respective experimental manipulation had been implemented. The scale was adapted from Simons et al. (2003) (see Section 4.1.3 for details on this study) and was made up of the three items presented in Table 8.2. Participants had to indicate their level of agreement with these statements on a six-point Likert scale, ranging from 1 = “do not agree at all” to 6 = “strongly agree“. The reliability of this scale was satisfactory with Cronbach’s alpha lying at .70.

Table 8.2
Manipulation check scale measuring students’ self-reported content relevance

Item 1	“I will study with the text, because I consider its content as personally relevant.”
Item 2	“I will study with the text, because it will provide me with relevant knowledge for my study programme.”
Item 3 (recoded)	“I will only study with this text, because I was asked to do so.”

Suspiciousness check. In order to gather information as to whether or not participants had become suspicious about the real purpose of the study and, thus, needed to be eliminated in order to prevent the potential influence of experimental demand characteristics, participants had to summarise the study’s purpose at the very end of Experiment 3. In this way, students were given the chance to utter their suspicion without being explicitly triggered that the true purpose of the experiment did not correspond to the one suggested. None of the 100 participants remarked any kind of such suspicion.

Experimenter bias. The present experiment was conducted in small groups (i.e., two to four). As students in each of these groups started the experimental session together, it seemed inappropriate to deny the students the right to ask any questions from the very beginning. This was

done in Experiment 2 under the pretence that this would disturb the participants already studying. In the current scenario, however, this would have only raised students' suspiciousness about the suggested study purpose. To prevent any undermining of the experimental manipulation through potential questions students might ask about the presented information, it seemed more appropriate that all participants within one session received the same experimental treatments. The groups' assignment to the four experimental conditions was completely randomised³⁹.

Now, this procedure raised the issue of the influence of the experimenter's expectations about the study's outcome or rather his/her biased behaviour within the individual experimental sessions. However, because questions were permitted it did not seem appropriate to leave the experimenter blind to the experimental treatments of each group. Following Rosenthal's (1985) suggestions, the problem of experiment bias was counteracted with the strict standardisation of all the group sessions. The experimenter only briefly informed the participants at the very beginning of the session about the general task (i.e., that they would have to study on their own with a text), the general procedure (i.e., that they would first receive a short introduction into the study's purpose together with some preliminary questions, then they would receive the text and afterwards a final questionnaire) and the time frame given for studying with the text (i.e., 25 minutes). These verbal instructions were prepared in advance and, hence, were identically worded across all experimental sessions. The remaining experimental instruction with the different experimental manipulations was presented only in written form. Besides, a simple standardised answer to students' potential questions concerning the various experimental manipulations during the session was also

³⁹ To prevent similarity of participants within one group session amounting to a sample bias, attention was paid during recruitment so that students out of each lecture would assign themselves to different group sessions.

formulated a priori, asking them to postpone any questions to the end of the session.

Instructional medium. The text used in Experiment 3 represented a shortened version of the text used in Experiment 2. The third section on “learning through insight” was eliminated, because students had indicated that the time to study the text had been too short in Experiment 2. As this implied at the same time a significant shortening of the achievement measure, the two sections on classical and operant conditioning were enriched. A few more details on both theoretical approaches were added to increase the density of the represented knowledge. This proceeding ensured that comprehensive knowledge acquisition was possible in the current learning scenario. The last revisions entailed changing the text’s layout into the layout used by a renommed book publisher (i.e., Springer) and making the copies of the text look like copies taken from a book (see Appendix G). These changes aimed at furthering the authenticity of the experimental scenario.

Dependent factor 1: satisfaction. The same scale already used in Experiment 2 was used to gauge students’ satisfaction with the text. Again after the exclusion of Item 3 the reliability of this scale was satisfactory, with Cronbach’s alpha lying at .78. For each participant a final satisfaction score was computed by taking the mean score of the three individual item responses.

Dependent factor 2: achievement. Due to changes in the text (see above subsection on the instructional medium and its content), changes to the achievement measure had also to be applied. Questions concerning the excluded section on “learning through insight” were eliminated and new items concerning the additional information about classical and operant conditioning were included. Finally, the open items were either changed into a multiple-choice format (if possible) or excluded to render the scoring procedure more straightforward. These changes resulted in eleven multiple-choice items. Each of these contained only one correct answer,

several distractor items and one item to indicate incapability to answer a question. Table 8.3 gives an example item for the purpose of illustration (the complete achievement scale is presented in Appendix E, containing the different versions of the entire instruction). The reliability of the achievement scale was rather low, with Cronbach’s alpha lying at .50. Overall, the range of scores was zero to eleven points, with one point given for each item answered correctly.

Table 8.3
Example of an additional multiple-choice item included in the achievement measure

Item 9	To maximise the increasing effect of a reward on a specific behaviour, the reward should be given:
a.)	immediately after the behaviour has been displayed <input type="radio"/>
b.)	just briefly before the behaviour is going to be displayed <input type="radio"/>
c.)	at the same time as the display of the behaviour <input type="radio"/>
d.)	I cannot answer this question <input type="radio"/>

Mediator: quality expectations. The three items used to assess students’ quality expectations were similar to the three items used in Experiment 2. The reliability of this scale again turned out satisfactorily, with Cronbach’s alpha lying at .80. As before, single item responses were aggregated into a mean final satisfaction score for each participant.

Procedure. In comparison to Experiment 2, the recruiting procedure taken in Experiment 3 was much more formal. This time students were recruited in first year introductory lectures across the various departments of the University of Mannheim. Still the predetermined recruitment restrictions were taken into account (see section on participants in Experiment 2). At the beginning of each lecture a brief introduction of the study’s purpose (i.e., studying with various instructional media to be used within course modules on key skills development) was given and students were handed out a list to make an appointment for participation. The remaining procedure was similar to the one taken in Experiment 2, with the exception of the changes in terms of the small group assessment, the

assessment of students' suspiciousness about the study's purpose, the new content relevance manipulation check as well as the revisions of both the text's content and the achievement measure (for details see respective subsections above). Finally, in the present experiment, the studying time students used was taken down to assess whether the provided maximum time appeared sufficient. The results showed that all of the students used the total time allowed (i.e., 25 minutes).

Statistical methods. To analyse whether the experimental manipulations of the explicit information supplied about the instructional medium's quality and the content's relevance to the students had a significant effect on the two main outcome variables, satisfaction and achievement, two separate two-factorial between-subjects ANOVAs were conducted. For the same reasons given with respect to Experiment 2, no alpha-level adjustment was applied. Likewise, the statistical procedure of Experiment 2 was followed with respect to determining the level of statistical significance and the sizes of the effects identified.

In case the predicted two-way interaction between explicit quality information and content relevance regarding students' achievement was revealed in the omnibus ANOVA, this interaction effect would be further taken apart with the use of simple effects analyses (e.g., Field, 2005; Keppel & Wickens, 2004). This was to allow testing of the *a priori specified predictions* for the effect of the factor quality information at each individual level of the factor content relevance⁴⁰. In simple effects analysis

⁴⁰ Simple effects analysis investigates the effect of one factor at one level of another factor and is commonly used to follow up the *a priori* stated set of hypotheses underlying a predicted interaction term in multifactorial ANOVAs (e.g., Field, 2005; Keppel & Wickens, 2004). The reason for this is that on the basis of the result of the interaction term, one can only conclude that the effect of one variable differs depending on the level of another variable, but not whether—as in the current case—the factor quality information had a significant “simple” main effect on the moderate, but no “simple” main effect on the low or the high relevance level.

no alpha correction is needed, because—as Field (2005) demonstrates—a control for the Type I error rate is already algebraically built in⁴¹.

Following again the procedure taken in Experiment 2, the mediating function of quality expectations for the effect of explicit quality information on students' achievement and satisfaction was again investigated with the use of correlational and regression-analytical methods, but only if such an effect was shown to have occurred in the respective preceding analysis of variance. As explained in more detail for Experiment 2, because of the regression-analytical investigation of the effect of explicit quality information on quality expectations, the variance-analytical investigation of this effect was spared to avoid redundant analyses. The various kinds of statistical procedures⁴² were supported with the use of the statistical software SPSS (Version 11.5).

8.2 Results

Manipulation checks and check for suspiciousness. Regarding the suspiciousness item, no participants had generated any kind of doubt against the suggested study purpose and had to be excluded thereof. Furthermore, the manipulation check for the explicit quality information supplied was scrutinised to ensure that students had indeed noticed the

⁴¹ This is because in simple effects analysis the *F*-value is based on the *MS* error derived from the omnibus ANOVA analysis (the residual mean square for the entire model) and *not* on the mean square error of each separate comparison (as would normally be used when computing several individual one-factorial ANOVAs post-hoc to follow up a two-way interaction). In other words, since the *MS* error from the omnibus analysis will be bigger than the *MS* error for the individual comparison, the resulting *F*-values for the simple effects analyses will be reduced in size compared to the same *F*-values derived, if one would simply run separate ANOVAs. Hence, the *F*-values derived in simple effect analysis are already more conservative.

⁴² Exerting these various statistical procedures again was preceded by testing the normality of the distribution of the residual scores of the variables involved (i.e., quality expectations, achievement and satisfaction) within the experimental groups as well as testing the homogeneity of variance for all of these variables across the experimental groups (Bortz, 1993; Field, 2005). The procedure was similar to the one taken in Experiment 2. However, since testing the normality assumption this time required the conduction of a great number of tests, the alpha-level was reduced to .01. The overall result was that no violations of the normality assumption had occurred (for all *z*-values the following applied: $-2.58 < z < 2.58$). Similarly, conducting a Levene's test for each of these variables did not pinpoint any inequality of variance (all *F*s ≤ 2.65).

respective information. Here, it was revealed that five participants had not been able to remember the correct information. These participants were excluded from the main analyses (remaining $N = 95$)⁴³. Concerning the treatment check for the second independent factor, a one-factorial ANOVA with content relevance as between-subjects factor showed no significant effect on students' relevance perceptions of the learning content (low: $M = 3.93$ [$SD = 1.13$] vs. moderate: $M = 4.19$ [$SD = 1.11$]). The implications following on from this finding will be further discussed in the main analyses presented next.

Effects of explicit quality information and relevance on achievement. To assess the predicted effects of the experimental factors quality information and content relevance on students' achievement, a two-factorial between-subjects ANOVA was conducted. This demonstrated a significant main effect of quality information ($F [1, 91] = 5.26$; $p < .05$; $\eta_p^2 = .06$). As Table 8.4 shows, explicit positive quality information (compared to respective negative information) significantly promoted students' achievement. However, neither an effect of the factor content relevance, nor an interaction effect of the two independent factors, was revealed.

Table 8.4

Achievement under different conditions of explicit quality and content relevance information

Induced content relevance	Positive quality information			Negative quality information			Overall		
	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>
Low	7.09	1.62	23	5.79	2.21	24	6.43	2.03	47
Moderate	7.08	1.91	24	6.71	1.20	24	6.90	1.59	48
Overall	7.09	1.75	47	6.25	1.82	48			

A plausible explanation for the failure to produce the expected interaction pattern for the two independent factors quality information and content relevance might be provided by the result for the treatment check of the

⁴³ All participants in the explicit positive quality information group recalled that the text was described as highly recommendable/recommendable. All but five participants in the explicit negative quality information group recalled that the text was described as not optimal/insufficient.

factor content relevance. As outlined above, this measure showed that the means of students' self-reported content relevance perceptions in the two content relevance groups were not significantly different and laid both quite close to the theoretical midst of the scale (low: $M = 3.93$ [$SD = 1.13$]; moderate: $M = 4.19$ [$SD = 1.11$]). Thus, the different information provided to manipulate the content relevance perceived by the students had not produced the intended group differences, but rather a moderate level of perceived relevance of the learning content across the two groups. Based on these results, it might be assumed that the missing interaction was down to the unsuccessful treatment variation and not to the lacking impact of the factor content relevance per se.

Computing a new relevance factor based on a median split of students' self-reported relevance perceptions (i.e., the treatment check of the experimental factor content relevance) seemed a valid method to investigate this idea further. Thus, two new quasi-experimental groups were generated: a lower relevance perceptions group ($M = 3.07$ [$SD = 0.72$]) and a higher relevance perceptions group ($M = 4.95$ [$SD = 0.48$]). Reanalysing the data with this new group factor (using a two-factorial ANOVA with quality information and relevance perceptions as between-subjects factors) revealed the following results. Again, a main effect of quality information appeared ($F [1, 91] = 3.68$; $p < .05$ [one-tailed]; $\eta_p^2 = .04$), with higher achievement following from explicit positive compared to explicit negative quality information (see Table 8.5). Students' content relevance perceptions produced no significant main effect on achievement—just as the experimental factor. Yet, most notably, an interaction effect between quality information and relevance perceptions was established, just slightly falling short of statistical significance ($F [1, 91] = 3.82$; $p = .054$; $\eta_p^2 = .04$). Thus it still seemed justified to explore this interaction effect further.

Since no a priori set of predictions was stated for the interaction between the factor quality information (positive vs. negative) and the quasi-experimental factor relevance perceptions (lower vs. higher) this was not

done with the use of simple effect analysis, but with a Bonferroni-corrected one-factorial ANOVA with quality information as a between-subjects factor for each of the two relevance perceptions groups. These analyses revealed that whereas in the lower relevance perceptions group no significant effect of explicit quality information had occurred, a significant difference with a strong effect size had resulted from explicit quality information in the higher relevance perceptions group ($F [1, 91] = 6.43$; $p < .05$; $\eta_p^2 = .12$). As illustrated in Table 8.5, this effect entailed the superiority of the explicit positive quality information group's achievement compared to the explicit negative quality information group's achievement.

Table 8.5

Achievement under different conditions of explicit quality information and students' content relevance perceptions

Content relevance perceptions	Positive quality information			Negative quality information			Overall		
	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>
Lower	6.93	1.74	28	6.94	1.09	17	6.93	2.03	45
Higher	7.31	1.80	19	5.87	2.05	31	6.42	1.59	50
Overall	7.09	1.75	47	6.25	1.82	48			

Effects of explicit quality information and content relevance on satisfaction. Concerning the testing of the experimental hypotheses stated with respect to the second main outcome variable satisfaction, again a two-factorial between-subjects ANOVA was computed. This revealed a main effect of quality information on students' satisfaction ($F [1, 91] = 3.73$; $p < .05$ [one-tailed]; $\eta_p^2 = .04$). As can be deduced from Table 8.6, explicit positive quality information (compared to respective negative information) significantly elevated students' satisfaction levels after actually studying with the text. This time in line with the predictions, no other significant effect appeared for the dependent measure satisfaction; neither a main effect of the second independent factor content relevance nor an interaction effect between the two independent factors.

Table 8.6

Satisfaction under different conditions of explicit quality and content relevance information

Induced content relevance	Positive quality information			Negative quality information			Overall		
	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>
Low	4.59	0.92	23	4.38	0.97	24	4.48	0.94	47
Moderate	4.88	1.14	24	4.25	1.20	24	4.56	1.20	48
Overall	4.74	1.03	47	4.31	1.08	48			

Quality expectations as mediator. To investigate whether the effect of quality information on students' learning outcomes was mediated via students' quality expectations about the instructional medium a series of regression analyses was to be conducted. However, as can be seen from Table 8.7, a first screening of the intercorrelations between the variables involved showed no significant correlation between the factor explicit quality information (negative = 1 vs. positive = 2) and students' quality expectations.

Table 8.7

Intercorrelations (point biserial and product moment, respectively) between explicit quality information (negative = 1 vs. positive = 2), quality expectations, achievement and satisfaction across the two relevance conditions (N = 95)

Variables	1	2	3	4
1: Quality information	—			
2: Quality expectations	.057	—		
3: Satisfaction	.281**	.188*	—	
4: Achievement	.230*	-.071	.078	—

** $p < .01$, * $p < .05$ (all tests of significance conducted one-tailed)

A further look at the descriptives concerning students' quality expectations in the four experimental conditions (see Table 8.8) also supports the notion that no relation existed between the explicit quality information provided to students and the quality expectations reported by the students subsequently. On the basis of these results, scrutinising the mediating function of quality expectations for the effect of explicit quality information did not seem promising. Thus, the conduction of further regression analyses was deemed superfluous.

Table 8.8

Quality expectations under different conditions of explicit quality and content relevance information

Induced content relevance	Positive quality information			Negative quality information			Overall		
	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>
Low	3.42	0.54	23	3.46	0.59	24	3.44	0.56	47
Moderate	3.50	0.54	24	3.33	0.63	24	3.42	0.59	48
Overall	3.46	0.54	47	3.40	0.61	48			

8.3 Discussion

To recapitulate the outlined results, the experimental hypotheses concerning the effect of explicit quality information on students' satisfaction and achievement with an instructional medium were confirmed. Explicit positive quality information given to students prior to studying with a printed text resulted in significantly higher achievement levels than respective negative information. Similarly, explicit positive quality information brought about higher satisfaction ratings for the instructional medium after the students had actually studied with it compared to respective negative information. As in Experiment 2, the size of the quality information effect on achievement was within the moderate range. The size of the quality information effect on satisfaction was small.

Concerning the interaction effect hypothesised for the two independent factors quality information and content relevance on students' achievement the predicted pattern of results could not be verified with the present data. The described effect of quality information did not only occur as expected in the moderate relevance condition, but was also present in the low relevance condition. The explanation put forward for the missing interaction effect was that the experimental manipulation of the factor content relevance had not been successful. This explanation was backed up by the results produced in relation to the respective manipulation check, showing no significant differences in students' self-reported relevance perceptions between the two experimental content relevance

conditions. Thus, the information that the key skills module would be either introduced as an obligatory part of the curriculum for the entire studentship at the University of Hannover at a specific point in time or for the entire studentship at the University of Mannheim at an unspecific point in time did not seem to have affected students' content relevance perceptions differently. This might be the reason why the experimental variation of the relevance information did not have a moderating effect on the quality information effect on students' achievement.

Reclassifying students on the basis of their self-reported relevance perceptions into a lower and a higher relevance perception group (i.e., 3.07 vs. 4.95 on a scale ranging from one to six) showed an almost significant interaction effect between the explicit quality information provided and the new factor relevance perceptions on students' achievement. Further analyses demonstrated that whereas explicit quality information produced no differences in the achievement of students with lower relevance perceptions, explicit positive quality information (compared to respective negative information) resulted in an achievement benefit for students with higher relevance perceptions. On the basis of these findings it might be concluded that the problem concerning the failure to produce a significant interaction effect between the two factors content relevance and quality information resided within the experimental manipulation of the factor content relevance and not within the factor content relevance per se.

However, the interpretation of the results produced within this reanalysis appears somewhat problematic because of the following two reasons. First, the distribution of the participants to the individual conditions in the reclassification analysis was no longer randomised. Thus, other unknown confounding factors might have been responsible for the group differences in terms of students' achievement as well as in terms of students' relevance perceptions. Second, the interpretation of the results is difficult, because it is not clear whether the higher relevance perceptions can still be taken to represent a moderate level of content

relevance (i.e., a mean score of 4.95 on a scale, ranging from one to six). Only if this scale mean is accepted as representing a moderate relevance level (and not a high relevance level), the experimental results for the moderating effect of students' relevance perceptions on the quality information effect could be considered in line with the experimental hypothesis.

In view of these issues, a firm conclusion with respect to the moderating role of students' perceived relevance of the learning content for the effect of explicit quality information about an instructional medium on students' achievement can not be reached. Rather further experimental inquiry seems to be necessary. Within Experiment 4 the moderator effect of students' perceived content relevance was explored anew. Thereby, an attempt was made to maximise the differentiation of the various pieces of information given to the students to induce varying levels of personal relevance of the learning content. Furthermore, a third level of high personal relevance was also introduced to investigate whether or not a quality information effect is generated under this condition.

Another unexpected finding within Experiment 3 was that no relationship between explicit quality information and students' self-reported quality expectations was apparent. This contrasted with the result of Experiment 2 and also meant that the QIIM's assumption about the mediating function of quality expectations for the different effects' of explicit quality information on students' learning outcomes was discounted. A possible explanation for the lack of relation between explicit quality information and quality expectations might be that the students in the present study were reluctant to utter quality expectations without any observable evidence. In fact, this is exactly what Darley and Gross (1983) demonstrated in a study conducted in the framework of the classic Pygmalion effect. Their study showed that the supply of different information about a child's socioeconomic background (i.e., high vs. low) caused differences in ability ratings of this child *only* when the raters were also provided with some relevant evidence, on which to base their

judgment on (i.e., a video tape sequence, in which the child responded to achievement test problems).

Yet this explanation still leaves the question, why this phenomenon did not occur in Experiment 2. Here, a significant effect of explicit quality information on students' quality expectations was shown. Maybe the increased formalisation of the present experiment compared to Experiment 2 (i.e., students receiving an official announcement of the study within their lecture by a researcher, the making of appointments at a later point in time at an off-campus location and the small group assessment vs. being recruited from various on-campus locations by other students, being sent straight away to the experimental session just taking place at another on-campus location and being assessed in larger groups) had made the students take the lack of any observational evidence to base their judgement on more seriously. Thus, students in Experiment 3 might have been more resistant to answering the questions based on the explicit quality information provided. This resistance might have resulted in the inflation of the group differences with respect to students' quality expectations.

This interpretation of the results received further support with the following observations of the experimenter. Within the present experiment many of the students asked whether they should fill in the quality expectation items actually before or rather after having seen the text. No such questions were raised in Experiment 2. According to this rationale and in line with Darley and Gross' (1983) procedure, in Experiment 4 students were provided with some evidence to base their quality expectations on: They were allowed to briefly scan the instructional medium for a very short time (i.e., 60 seconds). Only then did they have to indicate their quality expectations.

In closing this review of Experiment 3, a general note of caution has also to be made with respect to the results obtained for the dependent variable achievement. Whereas in Experiment 2 this scale showed adequate

reliability, in the present experiment the reliability appeared insufficient. This impairment might have been due to the revisions applied to the achievement measure, which were necessary because of the changes in the content of the instructional medium. In view of this result, the findings of Experiment 3 concerning the variable achievement must generally be interpreted with some reservation. Therefore, the revision of the achievement scale used in Experiment 4 aimed at raising the reliability of this measure again to an adequate level. Finally, it must also be mentioned that the 25 minutes of maximum studying time with the instructional medium seemed to be still rather short, with all of the participants using the total amount of time provided (for details see experimental procedure in Section 8.2). Thus, in Experiment 4 the maximum studying time allowed was extended.

9. Experiment 4: Content Relevance and Cue Giver Competence as Moderators of the Effect of Explicit Quality Information

Aims and hypotheses. As in Experiment 3, the main focus of Experiment 4 was to test the QIIM's assumptions concerning the effect of explicit quality information about an instructional medium on students' self-regulated learning outcomes and its moderating and mediating conditions. However, several revisions and extensions were applied to the present experimental design. First, to allow for generalising statements on the effect of explicit quality information across different types of media, the text was presented on the computer as a hypertext and not as a printed text. The actual content of the text was left unchanged. Second, the operationalisation of the low and the moderate level of the suggested moderator content relevance was revised and a third high relevance level was introduced. Third, the factor cue giver competence (high vs. low) was additionally included as a moderator to be investigated. As in Experiment 2 and 3, the factor competence of the author of the instructional medium was held constant at a high level to promote the authenticity of the experimental situation. Fourth, the assumed mediating function of students' cognitive processing—including both students' general cognitive effort put into learning and the specific learning strategies used therein—was subsumed in the experimental inquiry. Next, the rationale behind the three latter changes will be discussed in detail together with the various experimental predictions.

One major aim of Experiment 4 was to reinvestigate the moderating function of content relevance on the effect of explicit quality information about an instructional medium on students' learning outcomes. However, the manipulation check in Experiment 3 had revealed the experimental variation of low vs. moderate content relevance to be unsuccessful. Both treatment levels seemingly had induced moderate relevance perceptions in the students. Thus, the operationalisation of these relevance levels was in

need for revision. The aim was to further differentiate the respective pieces of relevance information provided, thereby maximising the differential effect on students' content relevance perceptions. This involved the following significant change. In Experiment 3, low content relevance was to be induced with the information that the instructional medium would be applied within a course unit on key skills development, becoming obligatory for the entire studentship at a different, but not very far removed university. To induce low content relevance in the present experiment, the course unit was claimed to become obligatory only for a specific student subsample at a very far removed university (for more details on the relevance manipulation see the respective subsection in Section 9.1 below).

Another change concerning the factor content relevance was the inclusion of a third level of high relevance. As outlined in detail in Chapter 5 (see Section 5.1.3 in particular), the QIIM predicted no effect of quality information on students' learning outcomes at this level. Although the high level of content relevance was not experimentally induced in Experiment 3, the data generated therein still put this assumption somewhat into question. As such, a reanalysis using students' self-reported content relevance perceptions as a quasi-experimental between-subjects factor (lower vs. higher) showed the following result. An effect of explicit quality information appeared for students with higher relevance perceptions, but not for students with lower relevance perceptions. The mean relevance perceptions of the group with the higher relevance perceptions lied just amidst the theoretical moderate and high relevance level (for details see Section 8.2 and Section 8.3). Hence, the results of the reanalysis could not unequivocally be interpreted with respect to the QIIM-derived hypotheses, stating a quality information effect on students' learning outcomes at the moderate, but not at the high relevance level. Furthermore, the use of the quasi-experimental factor was discussed as further aggravating the interpretation of the outlined evidence, because of potential selection effects due to the lack of randomised assignment of the

participants to the various conditions. Introducing a high level of the experimental factor content relevance, Experiment 4 tested the QIIM's assumption that no explicit quality information effect should appear at this level.

The inclusion of the high relevance level resulted in a slight change in the experimental predictions deduced from the QIIM. An ordinal interaction effect between explicit quality information (positive vs. negative) and content relevance (low. vs. moderate vs. high) was now postulated to occur *on both* students' achievement and students' satisfaction with the instructional medium used (see Section 5.1.3 in particular). Given moderate relevance, students who had been supplied with explicit positive quality information should show higher achievement outcomes and higher satisfaction ratings than students who had received respective negative information. Given low content relevance, an effect of explicit quality information effect was only expected with respect to students' satisfaction, not on students' achievement. Given high content relevance, no effect of explicit quality information should occur on either students' achievement or students' satisfaction (provided again that the instructional medium would be of good instructional quality).

Another extension of Experiment 3 was the investigation of another moderator defined in the QIIM: the competence of the cue giver. Experiment 1 had established that low cue giver competence attenuated the effect of explicit quality information on students' quality expectations compared to high cue giver competence. Now, the present experiment aimed at exploring whether this moderating effect further transcended onto the outcome variables. Based on the QIIM as well as the result generated in Experiment 1, for both students' achievement and students' satisfaction an ordinal interaction between explicit quality information and cue giver competence was expected. Evidently, such interaction effects were predicted to be bound to occur only under the conditions of content relevance allowing for an effect of explicit quality information on these learning outcomes. Thus, for both dependent variables, overall a three-

way interaction between explicit quality information, content relevance and cue giver competence was postulated.

Regarding the dependent variable achievement, this three-way interaction can be specified as follows. Under moderate content relevance an effect of explicit quality information on students' achievement was expected to occur and this effect should be more pronounced given high cue giver competence than given low cue giver competence (i.e., ordinal interaction between explicit quality information and cue giver competence). Under high and low content relevance no effect of explicit quality information on achievement was predicted. Thus, also no interaction of the factors explicit quality information and cue giver competence was expected to appear in terms of students' achievement at these levels.

The three-way interaction of the independent factors on students' satisfaction with the instructional medium can be defined in a similar manner. At the two relevance levels where explicit quality information should produce a significant effect (i.e., low and moderate relevance), high cue giver competence should strengthen this effect compared to low cue giver competence (i.e., ordinal interaction between explicit quality information and cue giver competence). Given high relevance of the learning content to the students, no effect of explicit quality information was expected in terms of students' satisfaction ratings. Therefore, no interaction effect between the two factors explicit quality information and cue giver competence should occur on students' satisfaction under this relevance condition.

A final extension of Experiment 4 concerned the investigation into the mediation of the effect of explicit quality information on students' achievement. Here, in addition to the strictly cognitive mediator quality expectations, Experiment 4 assessed the cognitive-behavioural factor cognitive processing and its mediating role. As outlined in detail in Chapter 5 (see Section 5.1.4 and Section 5.1.5 in particular), at the moderate content relevance level at which explicit quality information

should exert a differential effect on students' achievement the following mediational path way was defined by the QIIM: Explicit positive quality information and respective positive quality expectations should lead to increased effort investment into learning and a higher use of deep learning strategies (i.e., elaboration and organisation strategies) compared to explicit negative quality information and respective negative quality expectations. This difference should ultimately result in differential student achievement, with the explicit positive quality information group outscoring the explicit negative quality information group.

Under low and high content relevance explicit quality information and respective quality expectations should exert no effect on students' cognitive processes. Thus, no quality information effect should appear for students' achievement levels. More specifically, under low content relevance a strong tendency for low cognitive effort investment into learning and little use of deep learning strategies should predominate, irrespective of the quality information provided. Under high content relevance, students should always spend a great amount of cognitive effort in learning and display a high use of deep learning strategies, irrespective of the quality information given.

In addition to the test of the QIIM's predictions about the mediating role of students' use of deep learning strategies for the effect of explicit quality information on students' achievement, Experiment 4 also included the investigation of the mediating function of students' use of surface learning strategies (i.e., rehearsal strategies). Since no specific hypothesis could be deduced for this issue from past research (for details see Section 5.1.5), this inquiry must be considered as explorative.

9.1 Method

Design. The fourth experiment encompassed a between-subjects design with three independent variables: explicit quality information, content relevance and cue giver competence. Explicit quality information was

varied on two levels (i.e., positive vs. negative), content relevance on three (i.e., low vs. moderate vs. high) and cue giver competence on two levels (i.e., low vs. high). The effects of these manipulations were observed with respect to students' satisfaction ratings of, and their achievement with, the instructional medium. Furthermore, in the present study the inquiry into the mediational factors was extended to include the suggested cognitive-behavioural mediators (i.e., students' learning strategies and cognitive effort investment put into learning) in addition to the strictly cognitive mediator quality expectations.

Participants. In the present experiment, the same restrictions were applied for the recruitment of participants as in Experiments 2 and 3. Taking these restrictions into account, 199 students were selected out of introductory lectures across the different departments of the University of Mannheim. Their age range varied between 19 and 39 years, with a mean age of 20.94. 102 of the participants were male, the remaining 97 female. Their average enrolment time was 1.65 semesters, ranging between a minimum of one and a maximum of two semesters⁴⁴. As an incentive for participation students received ten Euros.

Independent factor 1: explicit quality information. Similar to Experiments 2 and 3, half of the participants were supplied with explicit positive and the other half with explicit negative quality information about the instructional medium to be used. This quality information was contained again within a bogus newspaper article contained within the written instructions provided to the participants (see Appendix I for the different versions of the bogus newspaper article).

Independent factor 2: content relevance. Modelled on Experiments 2 and 3, the manipulation of students' perceived relevance of the learning content involved a cover story around certain changes within university curricula. However, this time a more extreme differentiation of the various pieces of

⁴⁴ Of the total of 199 students, 35 were studying economics, 62 business administration, 27 business education, 10 computer science, 39 law and 26 humanities.

information supplied to the different experimental groups was used. Furthermore, in addition to the low and moderate level of relevance, a high level of relevance of the learning content was introduced.

Low content relevance was induced with the information that the instructional medium used was designed particularly for a course on key skills development for students of electrical and mechanical engineering (two subjects not at all taught at the University of Mannheim), becoming obligatory at the Technical University of Cottbus (a very far removed location in East Germany) from the next semester onwards. Moderate content relevance was realised with the information that the instructional medium, with which the students would study was developed for a course on key skills development for the entire studentship of the University of Hannover from the next semester onwards. Furthermore, participants were told that similar curricular changes were being discussed at the University of Mannheim, but that so far no specific time frame for the implementation of these changes existed. High content relevance was meant to be induced by giving the information that the instructional medium was specifically designed for a course on key skills development to be run at the University of Mannheim, which would become obligatory in the following semester for all students within the “Hauptstudium”. Thus, for students in the “Grundstudium” (i.e., semester one to four), the situation was created that these students studied with an instructional medium, which they assumed they would be confronted with again later during the course of their study programme.

The relevance information appeared twice within the instructions: once at the very beginning of the written instruction and once in the bogus newspaper article added to the written instruction (see Appendix H for the different versions of the instruction and Appendix I for the different versions of the bogus newspaper article). Table 9.1 shows the relevance information contained within the different versions of the bogus newspaper article.

Table 9.1

Low, moderate and high content relevance information provided

Low content relevance	The Department of Electrical Engineering and the Department of Mechanical Engineering will introduce this comprehensive and partly computer-based key skills development programme as a compulsory course unit for their students from the onset of the upcoming winter semester 2004/5. For successful completion of the programme, students will be awarded a special certificate.
Moderate content relevance	It has been officially decided that this comprehensive and partly computer-based key skills development programme will become a compulsory course unit for all students at the University of Hannover from the onset of the upcoming winter semester 2004/5. For successful completion of the programme, students will be awarded a special certificate.
High content relevance	It has been officially decided that this comprehensive and partly computer-based key skills development programme will become a compulsory course unit for all students at the University of Mannheim from the onset of the upcoming winter semester 2004/5. For successful completion of the programme, students will be awarded a special certificate.

Independent factor 3: cue giver competence. Similar to Experiment 1, the following information was used to manipulate the perceived level of competence of the person giving the quality information. In the high cue giver competence condition students were provided with explicit quality information by an expert, whereas in the low cue giver competence condition the explicit quality information was supplied by a lay person. As Table 9.2 shows, the two different competence levels were again indicated through the cue giver's occupational and academic status (i.e., professor with PhD title vs. first semester student) and relevant experience in evaluating computer-based instructional media (i.e., head of a renommed educational science institution vs. first year student of a subject matter not related to the development of computer-based instructional media). The cue giver competence information was presented (together with the explicit quality information) within the bogus newspaper articles (see Appendix I for the different versions of the bogus newspaper article).

Table 9.2

Information provided about high and low cue giver competence (example involves explicit positive quality information)

Low cue giver competence	"The computer-based training Key Skills Development–Online, which was developed in cooperation with the University of Mannheim, was rated as didactically highly recommendable by Jens Roth, a first year law student."
High cue giver competence	"The computer-based training Key Skills Development–Online, which was developed in cooperation with the University of Mannheim, was rated as didactically highly recommendable by one of the external judges, Prof. Dr. Jürgen Baumert, Director of the Max-Planck Institute of Human Development in Berlin."

Manipulation checks and suspiciousness check. As in Experiments 2 and 3, students had to indicate at the end of the experiment whether they were able to recall the explicit quality information about the instructional medium given to them in the beginning. Furthermore, immediately after the supply of the content relevance information the respective manipulation check was administered (i.e., the content relevance perception scale). This scale had been already used in Experiment 3 and only needed some small adaptation to the present situation (i.e., referring to the hypertext and not to the text). This scale demonstrated again good reliability, with Cronbach's alpha lying at .77. For the experimental factor cue giver competence, the manipulation check was similar to the one used in Experiment 1. It was presented to students right after the manipulation check for the factor quality information. Participants were asked to indicate their perceptions regarding the expertise of the quality cue giver on a seven-point scale, ranging from high to low expertise. To assess students' suspicion about the true purpose of the study, similar to Experiment 3 students were again presented with an open-ended question at the very end of the experiment, asking them to summarise the study purpose in their own words. Appendix I contains the different versions of the entire experimental instruction used, including the suspiciousness and manipulation check measures.

Instructional medium. The instructional medium applied in the present experiment included the same content as the one used in the preceding experiment. But now this content was presented within a hypertext on the computer screen and not printed on paper. Furthermore, this hypertext

appeared to be integrated within a larger web-based training called *Key Skills Development-Online* (KSD-Online). However, students were told that for the purpose of the study the remaining modules were made inaccessible. Appendix J provides screenshots of the hypertext.

Dependent factor 1: satisfaction. The same scale used in Experiments 2 and 3 was administered to investigate students’ satisfaction levels with the instructional medium used. Yet the items were adapted to the present situation, referring to the hypertext and not to the printed text (see Table 9.3 for one example of the four items used). The reliability of this scale was satisfactory with Cronbach’s alpha lying at .73. Again, the individual items were combined into a final satisfaction score for each student by taking the mean value of the individual item responses.

Table 9.3
Example item of the adapted satisfaction scale

Item 24 (recoded)	“I don’t think that the KSD-Online module delivered any relevant knowledge on studying strategies for university or for work.”
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Dependent factor 2: achievement. In addition to the eleven multiple-choice questions used in Experiment 3, to assess students’ knowledge gain, students were presented with five cloze tasks (see Appendix H for the different versions of the entire experimental instruction, including also the complete achievement scale used). Overall, the achievement test displayed satisfactory reliability with Cronbach’s alpha lying at .78, after the exclusion of three of the multiple-choice items (Item 7, Item 6 and Item 12). Thus, the final maximum achievement score was 13 points, with one point given for each item answered correctly.

Mediational step 1: quality expectations. In addition to the three items administered in Experiment 3 to assess students’ quality expectations, one further item (Item 9) was included in Experiment 4. This item directly referred to the students’ quality expectation about the instructional medium: “I consider the KSD-Online module to be a high quality instructional medium.” The other three items were similarly adapted to

the present situation, referring to the hypertext and not anymore to the printed text. The reliability of this scale appeared satisfactory with Cronbach's alpha lying at .83, after the exclusion of Item 10: "I expect that the KSD-Online module will offer valuable knowledge about effective studying strategies.". The three remaining items were combined into a final quality expectation score for each student, by taking the mean value of the individual item responses.

Mediational step 2: cognitive effort and learning strategies. To assess students' cognitive processing various measures were taken, broadly categorisable into measures gauging the cognitive effort invested generally into learning with the instructional medium and measures assessing the specific learning strategies used therein. Cognitive effort investment was assessed with two measures. Firstly, the amount of notes students made voluntarily during studying on a DINA-4 piece of paper provided was recorded. This involved counting the exact number of words each student had written down. Furthermore, cognitive effort invested into learning was gauged in a more subjective way via students' self-reports. This involved the use of an adapted and shortened version of the effort investment scale out of the LIST (Wild & Schiefele, 1994; Wild, 2000). This resulted in the four items shown in Table 9.4.

Table 9.4
Scale measuring students' cognitive effort investment

Item 14	"Before I've stopped studying with the KSD-Online module, I've taken the time to reconsider all of the important aspects discussed therein."
Item 23	"I've immediately started to study the content of the KSD-Online module intensely."
Item 28	"When the level of difficulty of the KSD-Online module increased, I've not given up and continued studying until I fully understood the points made."
Item 32	"I have really put a lot of effort in studying with the KSD-Online module".

To assess students' learning strategies, again three LIST scales were adapted and shortened. For the assessment of deep learning strategies the organisation scale and the elaboration scale were used. The resulting items of the two scales are shown in Table 9.5 and Table 9.6, respectively.

Table 9.5

Scale measuring students' use of organisational strategies

Item 15	"I've made a diagram or some similar visual aid to have the content of the KSD-Online module available in a better organised structure."
Item 22	"To get a better grip on the KSD-Online module, I've made myself an overview of its content."
Item 26	"I've tried to arrange the content provided within the KSD-Online module in such a way as to facilitate memorising it."
Item 34	"In order to support my knowledge acquisition, I've written a short summary of the KSD-Online module's content in my own words."

Table 9.6

Scale measuring students' use of elaborational strategies

Item 16	"For clarification purposes, I've tried to find examples for the novel concepts and theories."
Item 21	"I've tried to link the new information with relevant existing knowledge I've already had."
Item 27	"I've related the newly acquired knowledge with my own experiences."
Item 29	"I've mentally visualised the KSD-Online module's content."
Item 31	"I've thought about how the content of the KSD-Online module applies to my everyday life."

The rehearsal strategy scale was taken to assess students' surface learning strategies and included the four items represented in Table 9.7.

Table 9.7

Scale measuring students' use of rehearsal strategies

Item 19	"To be able to remember the contents of the KSD-Online module, I have learned the crucial concepts and definitions by heart."
Item 25	"I have written down the most important contents of the KSD-Online module and rote learnt them."
Item 30	"At the end of each page, I have tried to recite the content of the KSD-Online module to myself."
Item 33	"I've learnt the content of the KSD-Online module through repeated reading."

Again, for all these scales, students had to indicate their level of agreement with the presented statements on a six-point Likert scale, ranging from 1 = "do not agree at all" to 6 = "strongly agree". Reliability indices for the cognitive effort scale and the three learning strategies scales were overall adequate with Cronbach's alpha lying at .69 for the cognitive effort investment in learning scale, .67 for the rehearsal learning

strategy scale, .79 for the organisation learning strategy scale and .76 for the elaboration learning strategy scale. Final scores for each scale were again derived by taking the mean values of each students' response to the individual items.

Procedure. The procedure taken in Experiment 4 was identical to the procedure taken in Experiment 3, except for the following changes. First, the information about the competence of the cue giver supplying the explicit quality information about the instructional medium was varied (high vs. low) and students were administered the respective manipulation check at the end of the experiment. Second, students were given 60 seconds to briefly scan over the instructional medium before having to state their quality expectations. Third, the cognitive-behavioural mediators (i.e., deep and surface learning strategies and subjective cognitive effort investment into learning) were assessed. The respective items were presented in combination with the satisfaction items at random after the studying period and before the achievement measure. Finally, the maximum time provided to study with the text was extended to 35 minutes, resulting in an extension of the overall session duration to approximately 60 to 75 minutes.

Statistical methods. To analyse whether the experimental manipulations had a significant effect on the two main outcome variables satisfaction and achievement, two separate three-factorial between subjects ANOVAs were applied without any alpha level adjustment (see Experiment 3 for the rationale of this proceeding). The procedure taken to determine the level of significance and the effect sizes was similar to the one taken in Experiment 3. Furthermore, also similar to Experiment 3, if a significant interaction effect should be revealed, simple effects analysis would be used to follow up this effect (for details on this procedure see Section 8.2)⁴⁵.

⁴⁵ If the predicted three-way interaction between the three factors involved occurs, the simple effect analysis this time would also involve scrutinising simple main effects

If a significant effect of quality information was pinpointed under specific moderating conditions, the postulated mediating path way would be further investigated using correlational and path-analytical methods (Backhaus, Erichson, Plinke & Weiber, 2000; Kline, 1998)⁴⁶. This approach allows a test of the fit of correlational data with a theoretically postulated model (i.e., the QIIM). The theoretical model defines the relations between the different variables in terms of direction and quality. Based on the various intercorrelations, a causal system containing various path equations can be elaborated. This model can be tested in its adequacy by determining the fit of the correlations postulated on the basis of the theoretical model with the empirically identified correlations.

To assess the fit of a theoretical model with the data collected, a Likelihood Ratio test is generally used. This test assesses the assumption that the empirical covariance matrix matches the theoretical covariance matrix. The test statistic used for Likelihood Ratio tests follows a χ^2 -distribution. It needs to be emphasised that thereby the retainment and not the rejection of the null hypothesis is tested. Furthermore, to indicate the goodness of fit of the tested model the ratio of χ^2 divided by the degrees of freedom is commonly reported. According to Bollen (1989), values up to a maximum of two can be taken as an index of adequate fit of the model to the data. However, a limitation of the χ^2 -statistic is its sensitivity to the sample size, whereby with increasing sample size already a small divergence of the two covariance matrices to be compared can lead to a rejection of the null hypothesis. Thus, another fit index—the Goodness of Fit Index (*GFI*)—was used in the present investigation. The *GFI* is less dependent on the sample size and highly robust against violating the assumptions of normal distributions. The *GFI* is a relational measure of

(e.g., the effect of quality information under moderate relevance and high competence of the cue giver) as well as a simple interaction effect (i.e., the interaction between quality information and cue giver competence under moderate relevance).

⁴⁶ Path analytical procedures were necessary, because the mediational chain this time involved a sequential mediation with two steps (i.e., first step: quality expectations, second step: cognitive processing). The regression-analytical approach used in Experiments 2 and 3 was not adequate to test such a mediational path way.

the amount of variance and covariance explained by the theoretical model. For the *GFI*, values above .90 can be taken to indicate an adequate model fit (Bentler & Bonett, 1980). The final assessment tool used to judge the adequacy of the QIIM was the individual path coefficients, which should correspond in their significance and quality to the predictions of the QIIM. The analyses of variance and the correlational analyses were computed with the support of the statistical software package SPSS (Version 11.5) and the path analyses were conducted with the support of the statistical software package AMOS (Version 4.01)⁴⁷.

9.2 Results

Manipulation checks and check of suspiciousness. Regarding the suspiciousness item no participant had to be excluded thereof, since neither of the participants seemed to have generated doubts against the suggested study purpose. Furthermore, the manipulation check for the factor explicit quality information established that all but three participants recalled the respective information presented to them initially correctly. These three participants were excluded from the further analyses (remaining $N = 196$)⁴⁸. The application of a one-factorial between-subjects ANOVA demonstrated that students' relevance perceptions were this time significantly affected by the experimental factor content relevance ($F [2, 193] = 5.46$; $p < .01$; $\eta_p^2 = .05$). Low relevance information

⁴⁷ The use of these statistical procedures again was preceded by testing the normality of the distribution of the residual scores within the experimental groups as well as testing the homogeneity of variance across the experimental groups for all outcome variables (i.e., satisfaction and achievement) and all mediating variables (i.e., quality expectations, learning strategies and cognitive effort) involved. The procedure was similar to the one taken in Experiment 3. However, since this time the testing of both assumptions required the conduction of a great number of tests, the alpha-level was reduced to .01 for the calculation of confidence limits for z-transformed skewness and kurtosis indices as well as computing Levene's tests of homogeneity of variance. The overall result was that no violations of the normality assumption had occurred (for all z-values the following applied: $-2.58 < z < 2.58$). Similarly, conducting a Levene's test for each of the variables did not pinpoint any inequality of variance (all F s ≤ 2.25).

⁴⁸ All participants in the explicit positive quality information group recalled that the text was described as highly recommendable/recommendable. All but three participants in the explicit negative quality information group recalled that the text was described as not optimal/insufficient.

led to the lowest and high relevance information to the highest relevance perceptions (low: $M = 2.83$ [$SD = 1.32$]; moderate: $M = 3.34$ [$SD = 1.15$]; high: $M = 3.49$ [$SD = 1.14$]). When following this difference up with three individual one-factorial between-subjects ANOVAs, the differences between the low and the moderate as well as between the low and the high relevance group turned out significant (low vs. moderate: $F [1, 129] = 5.72$; $p < .01$ (one-tailed); $\eta_p^2 = .04$; low vs. high: $F [1, 128] = 9.47$; $p < .01$ (one-tailed); $\eta_p^2 = .07$). The difference between the moderate and the high relevance group was not significant. Because of this lack of statistical significance, the results derived for the moderate and high relevance conditions deserve particular attention (i.e., an additional reanalysis as done in Experiment 3). The analysis of the treatment check of the factor cue giver competence with a one-factorial between-subjects ANOVA confirmed that participants indeed perceived the level of competence of the supposed expert cue giver significantly higher compared to the novice cue giver ($F [1, 194] = 39.69$; $p < .001$; $\eta_p^2 = .17$; expert: $M = 5.35$ [$SD = 1.28$] vs. novice: $M = 4.16$ [$SD = 1.35$]).

Effects of explicit quality information, content relevance and cue giver competence on achievement. To test the effect of the experimental manipulation of the three factors explicit quality information, content relevance and cue giver competence on achievement, a three-factorial between-subjects ANOVA was conducted. This determined a significant interaction effect between the two factors explicit quality information and content relevance ($F [2, 184] = 3.79$; $p < .05$; $\eta_p^2 = .04$), but no other main or interaction effects. Thus, the factor cue giver competence did not play the significant role stated within the hypotheses, predicting a significant interaction term for the three factors quality information, content relevance and cue giver competence. Still, the significant interaction between explicit quality information and content relevance matched with the experimental predictions.

Following up the significant interaction effect between explicit quality information and content relevance with a simple effects analysis for the

effect of quality information for each of the three relevance conditions further revealed an unexpected result. Both at the moderate and at the high level of content relevance, a significant effect of explicit quality information had taken place (moderate: $F [1, 184] = 3.05$; $p < .05$ [one-tailed]; $\eta_p^2 = .02$; high: $F [1, 184] = 4.34$; $p < .05$; $\eta_p^2 = .02$). Under low content relevance the manipulation of explicit quality information had no effect on students' achievement. Furthermore, looking at the descriptives displayed in Table 9.8, it becomes apparent that the two main effects of quality information were indeed opposite in direction⁴⁹. In line with the QIIM-derived predictions, under moderate content relevance the achievement scores of the explicit positive quality information group clearly lay above the ones for the explicit negative quality information group. Against the experimental predictions, under high content relevance this pattern was reversed. Students to whom the instructional medium had been explicitly introduced as being of low quality outdid students who had been given explicit positive quality information. According to the QIIM, no differences in students' achievement should have appeared at all under high content relevance due to the manipulation of explicit quality information.

Table 9.8

Achievement under the different conditions of explicit quality and content relevance information

Relevance	Positive quality information			Negative quality information			Overall		
	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>
Low	7.71	2.90	34	7.39	3.29	31	7.55	3.07	65
Moderate	8.27	2.71	33	6.97	2.98	33	7.62	2.90	66
High	6.78	3.05	32	8.33	3.08	33	7.57	3.14	65
Overall	7.60	2.92	99	7.57	3.14	97			

Similar results were obtained when using a newly computed quasi-experimental relevance factor by splitting students into three groups according to their relevance perceptions (i.e., low: $M = 1-2.33$ [29%],

⁴⁹ To facilitate comprehension the descriptive data displayed in Table 9.9 was not further separated for the two different cue giver competence conditions.

moderate: $M = 2.67$ - 3.67 [36%], high: $M = 4$ - 6 [35%]). A three-factorial ANOVA with explicit quality information, relevance perceptions and cue giver competence as between-subjects factors revealed a significant interaction effect between quality information and relevance perceptions ($F [2, 184] = 3.96$; $p < .05$; $\eta_p^2 = .04$). Yet no other main effect or interaction effect was apparent. Most importantly the pattern within the descriptives on which this analysis was based was also similar to the one described above. Under low and moderate content relevance the scores of the explicit positive information group were above the explicit negative quality information group (low/positive: $M = 7.90$ [$SD = 2.60$] vs. low/negative: $M = 7.25$ [$SD = 2.94$]; moderate/positive: $M = 8.26$ [$SD = 3.00$] vs. moderate/negative: $M = 7.22$ [$SD = 3.16$]). Under high content relevance, the explicit negative quality information group scored higher than the explicit positive quality information group (high/negative: $M = 8.25$ [$SD = 3.26$] vs. high/positive: $M = 6.72$ [$SD = 2.95$]).

To throw further light on the outlined and partly predicted moderating function of content relevance on the effect of explicit quality information about the instructional medium on students' achievement, the data collected on the suggested mediators will be inspected separately for the two relevance conditions, in which a significant effect of explicit quality information had appeared. Without the moderating effect of the factor cue giver competence, the two respective conditions were not taken into account separately, but were instead collapsed in these mediational analyses.

Mediation of the explicit quality information effect on achievement under moderate relevance. At the moderate relevance level, explicit positive quality information (compared to explicit negative quality information) was assumed to increase first of all students' quality expectations. This in turn was suggested to promote students' cognitive processing, ultimately resulting in elevated achievement levels. To specify, cognitive processing included on a more general level the total amount of cognitive effort invested into learning with the instructional medium and on a more

specific level the amount of deep learning strategies (i.e., elaboration and organisation strategies) used therein. It is important to point out again that students' cognitive effort investment into learning was assessed in a twofold way: via students' self-reports and more objectively via the amount of notes students had made during studying.

To assess the validity of the QIIM's assumptions regarding the mediation of the effect of explicit quality information on students' achievement at the level of moderate relevance, separate path analyses were calculated for the two deep learning strategies (i.e., elaboration and organisation strategies) as well as the objective and the subjective cognitive effort investment into learning⁵⁰. Each path analysis tested the described sequential mediation and, thus, assessed a three-path indirect effect on students' achievement. Besides, an additional path analysis was conducted to analyse exploratively the mediational role of students' surface learning strategies (i.e., rehearsal strategies) for the effect of explicit quality information on students' achievement under moderate relevance. This path analysis assumed a mediational sequence similar to the one suggested for students' use of deep learning strategies. The intercorrelations of the various variables involved in the analyses conducted are presented in Table 9.9 above the diagonal. In addition, this part of Table 9.9 contains the correlations of these variables with students' satisfaction ratings under this relevance condition. To allow for a comprehensive picture of the relation between the factor explicit quality information and the various mediating factors, Table 9.10 also represents separately the descriptive statistics for the mediators under high and moderate relevance as well as under positive and negative quality information conditions.

⁵⁰ Because of the sample size ($n = 66$) simultaneous modelling of the different learning strategies and the cognitive effort investment (indexed either via students' self-reports or the amount of notes they had made during studying) seemed inappropriate.

Table 9.9

Intercorrelations (point biserial and product moment, respectively) between explicit quality information (negative = 1 vs. positive = 2), mediating and outcome variables separate for moderate (n = 66; above the diagonal) and high relevance condition (n = 65, below the diagonal)

Variables	1	2	3	4	5	6	7	8	9
1: Quality information	—	.33** ^a	.28* ^a	.26 ^a	.08** ^a	.35** ^a	.29*	.23* ^a	.28* ^a
2: Quality expectation	.16	—	.24* ^a	.26* ^a	.03	.25* ^a	.24*	.09	.57** ^a
3: Subjective cognitive effort (i.e., self-ratings)	.08	.43**	—	.26* ^a	.23*	.34**	.51**	.20* ^a	.13
4: Objective cognitive effort (i.e., amount of notes)	-.26*	.03	.37**	—	-.16	.71**	.36**	.29* ^a	.07
5: Elaboration strategies	.05	.47**	.54**	.14	—	.19	.17	.08	.16
6: Organisation strategies	-.01	.31*	.33**	.39**	.40**	—	.46** ^a	.17	.07
7: Rehearsal strategies	.16	.43**	.58**	.30*	.41**	.57**	—	.12	.07
8: Achievement	-.25*	-.03	.38**	.38**	.18	.03	.28*	—	.21*
9: Satisfaction	.31*	.67**	.41**	.17	.47**	.26*	.32**	-.02	—

** $p < .01$, * $p < .05$; ^a = tests conducted one-tailed

Table 9.10

Mediating factors under different conditions of explicit quality and content relevance information

	Relevance	Positive quality information			Negative quality information		
		<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>
Quality expectations	Moderate	4.46	0.88	33	3.90	0.99	33
	High	4.30	0.90	32	4.00	0.98	33
Elaboration strategies	Moderate	4.22	1.03	33	4.06	1.05	33
	High	4.37	0.94	32	4.25	1.23	33
Organisation strategies	Moderate	3.52	1.30	33	2.52	1.38	33
	High	2.70	1.41	32	2.73	1.41	33
Rehearsal strategies	Moderate	4.22	1.03	33	4.06	1.05	33
	High	4.37	0.94	32	4.25	1.23	33
Subjective cognitive effort	Moderate	4.42	0.88	33	3.90	0.90	33
	High	4.31	1.04	32	4.14	1.14	33
Objective cognitive effort	Moderate	50.15	50.43	33	24.55	46.11	33
	High	13.66	30.22	32	36.12	51.41	33

The path analytical investigation revealed that *only for the subjective and the objective cognitive effort investment into learning* the postulated mediational path way was confirmed. Here, satisfactory fit indices (model including objective effort: $\chi^2 [3, N = 66] = 4.28$; ratio = 1.43, $p > .05$; $GFI = .97$; model including subjective effort: $\chi^2 [3, N = 66] = 5.39$; ratio = 1.80, $p > .05$; $GFI = .96$) alongside significant and positive path coefficients for

each of the three postulated paths were revealed. Using the unstandardised path coefficients to describe the results obtained, if explicit quality information were increased by one unit (that is from negative = 1 to positive = 2), students' quality expectations increased by 0.57 units ($SE = 0.20$). An increment of quality expectations by one unit in turn resulted in an increase in the amount of words written down by the students (i.e., objective cognitive effort) by 14.83 units ($SE = 6.77$) and an increase in students' subjective effort ratings by 0.26 units ($SE = 0.13$). The increment of objective or subjective cognitive effort by one unit brought about a rise in achievement by 0.02 units ($SE = 0.01$) or 0.63 units ($SE = 0.38$), respectively. Figure 9.1 displays the standardised path coefficients (β) for the two three-path indirect effects, their individual significance level and the respective model's fit indices.

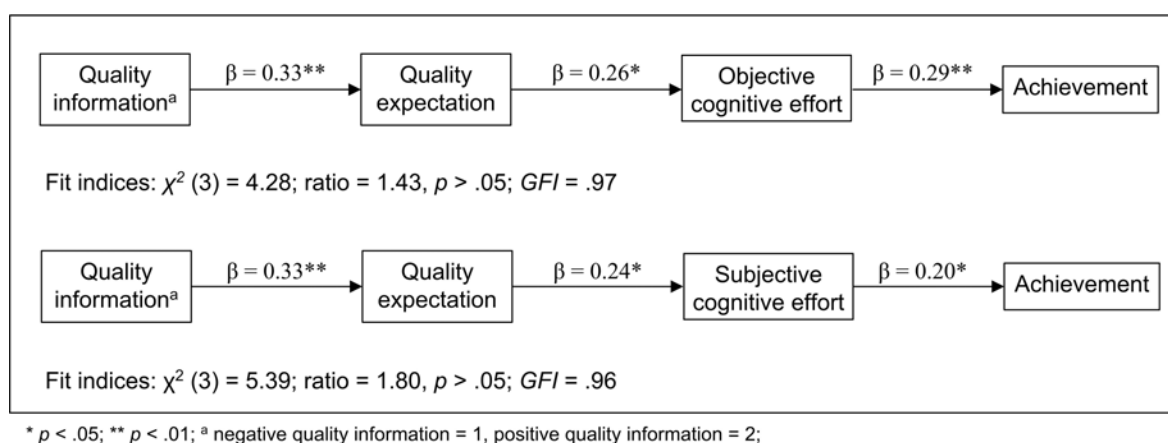


Figure 9.1

Path models of the predicted mediation of the effect of explicit quality information (1 = negative, 2 = positive) on achievement under moderate relevance ($n = 66$) via students' quality expectations and cognitive effort investment (using two different measures of cognitive effort)

Now, most importantly, when adding the direct path from quality information to achievement it did not turn out significant in either the model including subjective ($B = 1.06$; $\beta = 0.19$; $SE = 0.69$; $p > .05$) or the model including objective cognitive effort ($B = 0.94$; $\beta = 0.16$; $SE = 0.68$; $p > .05$). Furthermore, an additional z -test of each of the two indirect three-path effects established a significant result for the indirect path including subjective cognitive effort ($z = 2.17$; $p < .05$ (one-tailed)) and a near significant result for the indirect three-path effect including objective

cognitive effort ($z = 1.22$; $p = .11$ (one-tailed); for details on how to calculate the z -value for a three-path indirect effect see MacKinnon, in press). Based on these findings it can be concluded that the effect of explicit quality information was completely mediated via students' cognitive effort invested into learning.

Concerning the two deep learning strategies, the path-analytical analyses were not completely in line with the experimental predictions. For the mediation analysis involving organisation strategies not all of the fit indices appeared adequate ($\chi^2 [3, N = 66] = 8.17$; ratio = 2.73, $p < .05$; $GFI = .95$). Furthermore, not all of the postulated paths turned out to be significant. Although an increment in explicit quality information by one unit (that is from negative = 1 to positive = 2), resulted in a significant rise of quality expectations by 0.57 units ($SE = 0.20$) and an elevation of quality expectations by one unit, in turn, resulted in a significant increment of the use of organisational strategies by 0.41 units ($SE = 0.20$), ultimately the increment of organisational strategies by one unit did not provoke a significant rise in achievement ($B = 0.35$; $SE = 0.25$). Figure 9.2 provides the standardised path coefficients (β) for this three-path indirect effect, their level of significance and the model's fit indices.

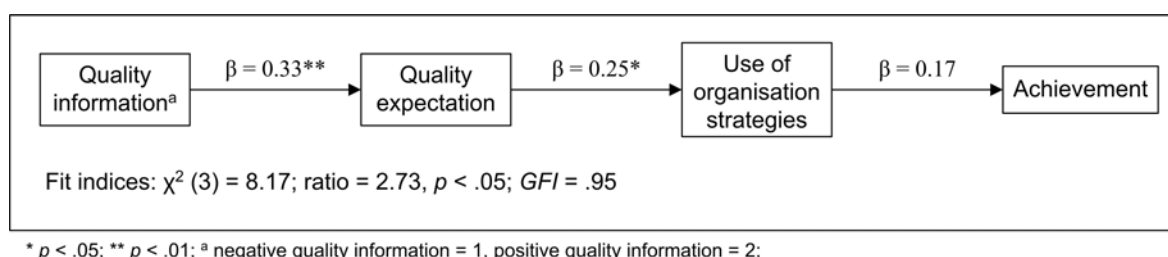
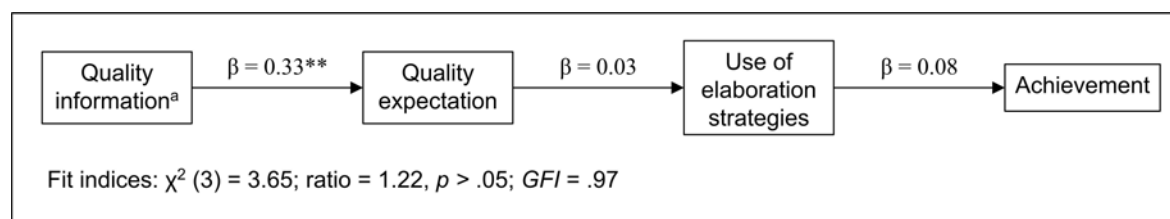


Figure 9.2

Path model of the predicted mediation of the effect of quality information (1 = negative, 2 = positive) on achievement under moderate relevance ($n = 66$) via students' quality expectations and use of organisation strategies

Concerning the path analysis involving the use of elaboration strategies, adequate fit indices were revealed ($\chi^2 [3, N = 66] = 3.65$; ratio = 2.73, $p < .05$; $GFI = .95$). Yet the path coefficients were not completely in accordance with the predictions. Although an increment in quality information by one unit (that is from negative = 1 to positive = 2) resulted in a significant rise

of quality expectations by 0.57 units ($SE = 0.20$), a rise in quality expectations by one unit did not significantly elevate the use of elaboration strategies ($B = 0.03$; $SE = 0.15$). Neither did an increment in use of elaboration strategies by one unit result in a significant achievement rise ($B = 0.21$; $SE = 0.35$). Figure 9.3 shows the standardised path coefficients (β) for this three-path indirect effect, their level of significance and the model's fit indices.

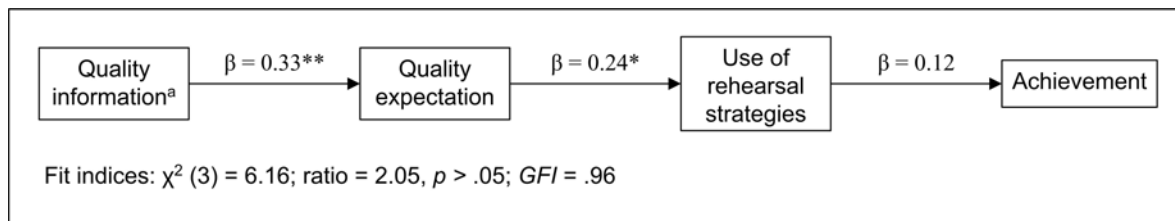


** $p < .01$; ^a negative quality information = 1, positive quality information = 2;

Figure 9.3

Path model of the predicted mediation of the effect of quality information (1 = negative, 2 = positive) on achievement under moderate relevance ($n = 66$) via students' quality expectations and use of elaboration strategies

Regarding the additional explorative analysis of the mediational role of students' surface learning strategies (i.e., rehearsal strategies), again adequate fit indices were revealed ($\chi^2 [3, N = 66] = 6.16$; ratio = 2.05, $p > .05$; $GFI = .96$). The unstandardised path coefficients of the two postulated paths showed that an increment in quality information by one unit (that is from negative = 1 to positive = 2), resulted in a significant rise of quality expectations by 0.57 units ($SE = 0.20$) and an elevation of quality expectation by one unit brought about a significant increment of the use of rehearsal learning strategies by 0.03 units ($SE = 0.13$). But ultimately an increment of rehearsal learning strategies by one unit did not cause a significant change in students' achievement levels ($B = 0.36$; $SE = 0.37$). Hence, similar to the two deep learning strategies (i.e., elaboration and organisation strategies), students' surface learning strategies appeared to have not been involved in the mediation of the quality information effect under moderate content relevance. Figure 9.4 represents the standardised path coefficients (β) for the three-path indirect effect involving students' use of surface strategies, the level of significance of these path coefficients and the model's fit indices.



* $p < .05$; ** $p < .01$; ^a negative quality information = 1, positive quality information = 2;

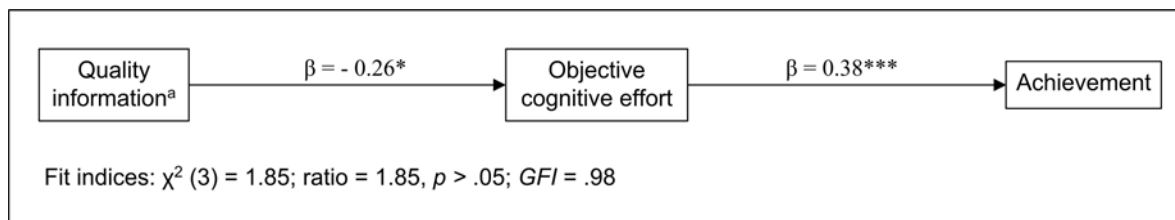
Figure 9.4

Path model of the predicted mediation of the effect of quality information (1 = negative, 2 = positive) on achievement under moderate relevance ($n = 66$) via students' quality expectations and use of rehearsal strategies

Mediation of the quality information effect on achievement under high relevance. For the high relevance condition, the experimental hypotheses predicted no differences in cognitive processing and achievement due to the different explicit quality information. Nonetheless, a reversed effect of explicit quality information was identified. To further investigate this effect, first an exploratory analysis of the intercorrelations between the explicit quality information, the various mediators and final achievement was conducted. The results are contained in Table 9.9 (below the diagonal). In addition, this part of Table 9.9 shows the correlations of these variables with students' satisfaction ratings under this relevance condition. Considering the relations to the potential mediating factors, it appeared that explicit quality information was at this relevance level only significantly associated with students' objective cognitive effort investment. Most notably this relationship was—similar to the relationship between explicit quality information and final achievement—negative ($r = -.26$; $p < .05$). The amount of notes students had made during studying decreased with positive information and increased with negative information. Furthermore, a significant positive relation existed between objective cognitive effort spent by the students and their achievement reached ($r = .38$; $p < .01$). This suggested anew a mediating function for students' objective cognitive effort expenditure, yet without the mediator quality expectations being involved.

An explorative path analysis further supported the mediating function of students' objective cognitive effort for the reversed effect of explicit quality

information under high relevance. The fit indices of the two-path indirect effect model were satisfactory ($\chi^2 [1, N = 65] = 1.85$; ratio = 1.85, $p > .05$; $GFI = .98$) and the paths from explicit quality information to objective cognitive effort and from objective cognitive effort to achievement were significant. If explicit quality information increased by one unit (that is from negative = 1 to positive = 2), the amount of words students had written down significantly decreased by 22.46 units ($SE = 10.41$). A decrement of the amount of words written down by one unit in turn resulted further in a decrease in students' achievement by 0.03 units ($SE = 0.01$). Figure 9.5 represents the standardised beta coefficients (β) for this two-path indirect effect, their level of significance and the model's fit indices.



* $p < .05$; *** $p = .001$; ^a negative quality information = 1, positive quality information = 2;

Figure 9.5

Exploratory path model of the effect of explicit quality information (1 = negative, 2 = positive) on achievement under high relevance ($n = 65$) via students' objective cognitive effort investment

Now most importantly, if the direct path between explicit quality information and achievement was included in this model, it did not turn out significant anymore ($B = -1.01$; $\beta = -0.16$; $SE = 0.74$; $p > .05$). This supported a full mediation of the reversed effect of explicit quality information under the high relevance condition via students' objective cognitive effort investment. In line with this interpretation an additional z -test of the indirect effect revealed a nearly significant result ($z = -1.80$; $p = .07$; for details on how to arrive at the z -value of this indirect effect see MacKinnon, Warsi & Dwyer, 1995).

Effects of explicit quality information, content relevance and cue giver competence on satisfaction. Concerning the effect of the experimental manipulation of the independent factors explicit quality information,

content relevance and cue giver competence on the dependent factor satisfaction with the instructional medium, again a three-factorial between-subjects ANOVA was conducted. This revealed a main effect of explicit quality information on satisfaction ($F [1, 184] = 16.54; p < .001; \eta_p^2 = .08$), but neither any other main effect nor any two- or three way interaction effects. As can be inferred from the descriptive data represented in Table 9.11, explicit positive quality information resulted in higher satisfaction ratings compared to explicit negative quality information independent of the level of content relevance⁵¹. Since the two factors content relevance and cue giver competence did not produce any two- or three-way interaction effect with the factor explicit quality information, the relevance and the cue giver competence conditions were again collapsed in the subsequent mediation analysis and not considered separately⁵².

Table 9.11

Satisfaction under different conditions of explicit quality and content relevance information

Relevance	Positive quality information			Negative quality information			Overall		
	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>
Low	4.68	.89	34	4.21	.89	31	4.46	.92	65
Moderate	4.70	.79	33	4.22	.85	33	4.46	.85	66
High	4.80	.65	32	4.27	.97	33	4.53	.86	65
Overall	4.72	.78	99	4.23	.89	97			

Mediation of the explicit quality information effect on satisfaction. To test the mediating function of students' quality expectations for the effect of

⁵¹ Again, to facilitate comprehension, the descriptive data displayed in Table 9.12 was not further separated for the two different cue giver competence conditions.

⁵² Thus, the factor cue giver competence showed the expected moderation effect neither for the outcome variable achievement nor for the outcome variable satisfaction. However, this factor had been demonstrated to exert a significant moderation effect on the effect of explicit quality information on students' quality expectations in Experiment 1. An additional analysis was conducted to determine whether or not at least this latter effect could be replicated within the current experiment. A two-factorial ANOVA, with explicit quality information and cue giver competence as between-subjects factors, revealed no interaction effect, but only a significant main effect of explicit quality information ($F [1, 192] = 18.45; p < .001; \eta_p^2 = .09$): Explicit positive quality information resulted in significantly higher quality expectations ($M = 4.38 [SD = 0.92]$) than explicit negative quality information ($M = 3.82 [SD = 0.93]$).

explicit quality information on students' satisfaction, again, a path analytical approach was used. The intercorrelations between the various variables involved are represented in Table 9.12. In addition, Table 9.12 also contains the correlation between these variables and students' satisfaction ratings.

Table 9.12

Intercorrelations (point biserial and product moment, respectively) between explicit quality information (negative = 1 vs. positive = 2), quality expectations, final satisfaction ratings and achievement scores (N = 196)

	F1	F2	F3	F4
F1: Quality information	—			
F2: Quality expectation	.29 ^{a**}	—		
F3: Satisfaction	.28 ^{**}	.59 ^{**}	—	
F4: Achievement	.005	.03	.08	—

^{**} $p < .01$ ^{***} $p < .001$; ^atesting conducted one-tailed

To allow for a comprehensive picture of the suggested mediator quality expectations, the descriptive statistics for this variable are made available in Table 9.13 separately for the two explicit quality information conditions.

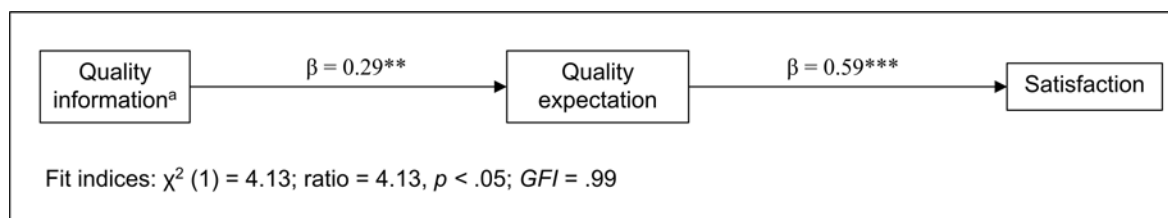
Table 9.13

Quality expectations under different conditions of explicit quality information

	Positive quality information			Negative quality information			Overall		
	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>N</i>
Quality expectations	4.38	0.92	99	3.82	0.93	97	4.11	0.97	196

The path analysis of the mediation of the effect of explicit quality information on students' satisfaction via students' quality expectations revealed the following result. The χ^2 -ratio turned out significant, (χ^2 [1, $N = 196$] = 4.13; ratio = 4.13, $p < .05$). Yet, as explained earlier, this measure is very sensitive in larger samples. Given the sample size of $N = 196$, the fit of the model was, hence, evaluated using only the *GFI*. This index turned out satisfactory ($GFI = .99$). Besides, the path coefficient for each of the two postulated paths were in line with the QIIM's postulation: If quality information increased by one unit (that is from negative = 1 to positive = 2), students' quality expectations were significantly elevated by 0.56 units ($SE = 0.13$). A rise in quality expectations by one unit in turn resulted in a

significant increment in students' satisfaction by 0.53 units ($SE = 0.05$). Figure 9.6 additionally provides the standardised path coefficients (β) for this two-path indirect effect, their level of significance and the model's fit indices.



** $p < .01$; *** $p = .001$; ^a negative quality information = 1, positive quality information = 2;

Figure 9.6

Path model of the predicted mediation of the effect of explicit quality information (1 = negative, 2 = positive) on satisfaction ($N = 196$) via students' quality expectations

Most importantly, however, when adding the direct path from explicit quality information to students' satisfaction ratings it did still turn out significant ($B = 0.21$; $\beta = 0.12$; $SE = .10$; $p < .05$)⁵³. Nonetheless, an additional z -test of the two-path indirect effect demonstrated a significant result ($z = 3.92$, $p < .001$; for details on how to arrive at the z -value of this indirect effect see MacKinnon, Warsi & Dwyer, 1995). Hence, although quality expectations did not completely mediate the effect of explicit quality information on students' final satisfaction, quality expectations appeared to have exerted at least a partial mediational function for this effect.

9.3 Discussion

To summarise, the most important result derived from Experiment 4 was that—in dependence on the relevance of the learning content to the students—explicit quality information about a computer-based hypertext significantly affected students' achievement with this instructional medium. With the demonstration of the moderating function of content relevance, Experiment 4 validated one of the central assumptions of the QIIM. Nonetheless, whereas the QIIM predicted an ordinal interaction

⁵³ As this model contained all possible paths, it had zero degrees of freedom and thus showed a perfect fit.

between explicit quality information and content relevance, a disordinal interaction did appear. As predicted students' achievement benefited from explicit positive compared to explicit negative information under moderate relevance, but not under low content relevance. Yet, unexpectedly, under high relevance students' achievement profited from explicit negative compared to explicit positive information. Under this last condition, no differences had been postulated to arise from the variation of explicit quality information about the instructional medium.

Analysing the disordinal interaction effect between explicit quality information and content relevance on students' achievement further, path analyses pinpointed students' cognitive effort invested into learning—but not students' deep learning strategies—to play a significant mediating role for the expected effect of explicit quality information. In accordance with the QIIM, under moderate relevance explicit positive quality information (compared to explicit negative quality information) elevated students' quality expectations. This, in turn, increased the amount of cognitive effort invested into learning and, finally, influenced students' achievement levels. This result was obtained with both the self-report measure and for the objective measure of cognitive effort.

For the unexpected effect of explicit quality information under high relevance, students' cognitive effort investment was again pinpointed to exert a mediating function. However, under this relevance condition, explicit quality information appeared to impact directly on students' cognitive effort investment into learning. Similar to the relationship between explicit quality information and achievement, the relationship between explicit quality information and cognitive effort was reversed from the one identified under moderate relevance: Negative information (compared to positive information) brought about an increase in the amount of effort expended. Again, in accordance with the results obtained at the moderate relevance level, these cognitive processing differences ultimately determined students' achievement. Higher cognitive effort expenditure promoted higher levels of achievement. It needs to be

emphasised again that this reversed effect was only apparent for the objective and not the subjective cognitive effort measure. Furthermore, as this effect was not postulated a priori by the QIIM, the evidence reported must be understood as the result of a first explorative analysis. Further theory-guided empirical investigation of the reversed effect of explicit quality information under the condition of high content relevance will be needed to draw sound conclusions about the reality of this phenomenon and its mediation.

Concerning students' satisfaction with the instructional medium, a significant effect of explicit quality information was established. This effect appeared to be independent of the relevance of the learning content to the students. Explicit positive quality information always led to higher satisfaction levels compared to respective negative information. Thus, the postulated interaction effect between explicit quality information and content relevance was not confirmed. Furthermore, this effect appeared to be partially mediated via students' quality expectations generated about the instructional medium before actually having studied with it. This mediation can be judged to be in line with the QIIM's assumptions.

Regarding the third independent factor, cue giver competence, the QIIM's predictions concerning its interaction with the factor explicit quality information did not receive empirical support. In contrast to the experimental hypotheses and the results of Experiment 1, the present results suggested that it did not matter whether the explicit quality information about an instructional medium was provided by an expert or a novice cue giver. More specifically, the variation of the cue giver's competence had neither an influence on the effect of explicit quality information on students' quality expectations about the instructional medium nor on the effects of explicit quality information on students' final learning outcomes.

In view of the presented summary of results, the last experiment can be said to have produced both validating and falsifying empirical evidence for

the QIIM's predictions. The remaining part of this discussion will focus on the explanation of two findings specific to the present experiment. First, an explanation for the lacking mediator function of students' learning strategies for the confirmed effect of explicit quality information on students' achievement under moderate relevance will be outlined. Second, three reasonable alternative theoretical approaches will be considered to account for the reversed effect of explicit quality information under high content relevance. Since the other findings also concern the three preceding experiments, discussing them will be postponed to the general discussion (Chapter 10) to avoid repetition.

Learning strategies as mediators. The results on students' use of learning strategies in Experiment 4 did only partly confirm the experimental hypotheses derived from the QIIM. Regarding the mediating role of deep learning strategies for the confirmed effect of explicit quality information on students' achievement under moderate relevance the following evidence was obtained. First, the use of elaboration strategies showed no relationship with any of the other variables. Second, the use of organisational learning strategies was significantly and positively associated with explicit quality information and quality expectations, but no relationship existed between students' use of organisational learning strategies and their final achievement. Furthermore, similar results to the ones obtained for organisational strategies were obtained in the explorative analysis of the mediating role of students' use of surface learning strategies as a mediating factor. As such, the use of rehearsal strategies was significantly and positively related to both explicit quality information and students' quality expectations. But students' use of these surface strategies was not related with students' final achievement.

A possible reason for the lack of predictive power of these individual learning strategies might be that students' achievement in a particular learning task might be best predicted from a specific combination of different learning strategies rather than one single learning strategy. Although research in the area of learning strategies has shown that

successful students combine different kinds of strategies within their studying behaviour (e.g., Artelt et al., 2001; Creß & Friedrich, 2000), so far no taxonomy has been developed to determine the combination of strategies promoting students' achievement in different types of tasks. An alternative explanation for the lack of predictive power of students' learning strategies might be the situation-specific but self-reported measuring approach of students' deep and surface strategies. As the work of Artelt (1999; 2000) suggested, the predictive power of the learning strategies students use might be increased with a change in the assessment method applied. More specifically, Artelt recommends the replacement of self-report scales with more behaviour-near assessment methods (e.g., behavioural observation or speaking aloud techniques).

Explaining the reversed explicit quality information effect under high relevance. For the reversal of the effect of explicit quality information on students' achievement from moderate to high relevance three different explanatory accounts appear reasonable. The first account might be called the *reactance effect explanation*. According to Brehm (1966; see also Wortman & Brehm, 1975), if people perceive their behavioural freedom illegitimately threatened, they will develop a motivational drive to counteract this threat. This motivational drive is termed psychological reactance. Once evoked, reactance further triggers attempts to reinstate, in some way or another, the loss of freedom or at least to prevent further loss of freedom. This might be done for example through performing the opposite behaviour of what is actually requested of the person or the development of negative attitudes.

Following this account, one might suggest that informing students that from the upcoming semester onwards they would need to take a mandatory course unit on key skills qualification has caused psychological reactance in those students. However, this explanation does not account for the observed differences between the explicit quality information groups' achievement under this high relevance information condition, with students having received explicit negative quality

information outperforming those given explicit positive quality information. Similarly, the reactance effect explanation cannot accommodate the identified differences between these two experimental groups in terms of cognitive effort investment, with the explicit negative quality information group spending more effort than the explicit positive quality information group. If reactance would have been the driving force behind the pattern of results, then the information concerning the impending curricular change should have affected the respective groups' effort investment and achievement performance independent of the explicit quality information provided about the instructional medium. Likewise, students' final satisfaction ratings should not have been impacted upon by the variation of this explicit quality information. However, this was again the case: First, the overall ratings of the high relevance group were not significantly different from the satisfaction ratings of the other two relevance groups. Second, the explicit positive quality information group—who had suffered most in their achievement from the high relevance information—still gave higher satisfaction ratings than the explicit negative quality information group. Therefore, the reactance effect explanation does not seem to fit with the entire pattern of results and another explanation needs to be sought for the reversal of the effect of explicit quality information from moderate to high relevance.

This second alternative account might be referred to as the *compensation effect explanation*. The phenomenon of compensatory effects has been discussed and empirically investigated already very early at the beginning of the 20th century by Hillgruber (1912) in his difficulty law of motivation: The more difficult a person perceives a task, the more effort will be invested by this person to solve the task. More recently, a meta-analysis by Mento, Steel and Karren (1987) confirmed that a rise in task difficulty resulted in a proportional performance increase across a variety of tasks. In empirical studies focusing on learning and memory performance in particular, similar results have been obtained. For example, Nelson and Narens (1994) have demonstrated that the time invested into a self-

regulated learning task is dependent on students' judgments of the task's level of difficulty. If a task is judged to be easy, less time will be invested into it compared to if the same task is being judged as difficult. Hence, students seem to attempt to compensate the perceived difficulty of a task with an increment in their time investment. Furthermore, and most importantly, some evidence also exists that such compensatory behaviour can have a balancing effect on students' final performance (e.g., Kintsch, Kozminsky, Streby, McKoon & Keenan, 1975)⁵⁴. Now, the important question of course is: How can these results be applied to explain the reversed effect of explicit quality information under high content relevance?

Assuming that perceiving the content provided by an instructional medium as difficult can be equated with perceiving an instructional medium and its content as low in quality, the following explanation might be elaborated. If students perceived the learning content of the instructional medium as highly relevant, explicit negative quality information in comparison to explicit positive quality information elicited a compensatory effect in terms of students' higher effort investment. This compensation behaviour ultimately brought about the superior performance of the explicit negative quality information group. However, this compensatory effect might have been bound to the condition of high relevance, since in the other relevance conditions students' motivation might simply not have been high enough to trigger such compensatory behaviour.

Yet, considering the results in the moderate relevance condition, a serious problem with the compensation effect explanation arises. This explanation does not account for the finding that explicit quality information under high relevance provoked a mirror-inverted effect to explicit quality information under moderate relevance. In other words, the achievement

⁵⁴ Some studies (e.g., Nelson & Leonesion, 1988), however, have also identified what has been termed a "labour-in-vain"-effect, namely that students' compensatory time investment did not have the expected compensatory effect on their final performance.

scores of the explicit positive quality information group under moderate relevance corresponded with the achievement scores of the explicit negative quality information group. Vice versa, the achievement scores of the explicit negative quality information group under moderate relevance commensurated with the achievement scores of the explicit positive quality information group under high relevance. To account for these results, the explanatory focus needs to be shifted from the superiority of the explicit negative quality information group's achievement to the inferiority of the achievement of the explicit positive quality information group. This focal shift is inherent in the third and final account of the reversed effect of explicit quality information under high relevance.

This third account might be designated as the *arousal effect explanation*. Arousal has been defined by Anderson, Revelle and Lynch (1989, p. 3) "...as a hypothetical construct representing the sum (in a principle component sense) of a variety of processes that mediate activation, alertness and wakefulness.". Thus, arousal is seen as a general state of physiological activation that does not inhere any directionality, ranges from deep sleep to high excitement and includes various electrocortical, autonomous and behavioural mechanisms⁵⁵. Similarly, arousal can be affected by a wide range of factors, such as drugs, electrical stimulation, sleep deprivation, incentives, individual personality and so on. The relationship between arousal and performance has received ample recognition at the beginning of the last century, with Yerkes and Dodson's (1908) hotly debated demonstration of the relationship between the arousal of mice and their habit-formation performance. Their results seemed to suggest that arousal benefits performance up to an optimal point, after which it begins to deteriorate performance. Furthermore, the level of optimal arousal appeared to be a negative monotonic function of task difficulty. Put differently, the more difficult the task was, the lower

⁵⁵ It must be noted that despite the difficulties inherent in the generality of the construct of arousal, the current state of research supports its usefulness for systematising and explaining a wide range of empirical evidence (for a more detailed discussion of this issue see for example Anderson, 1994).

the optimal level of arousal. Even if these first results and the implication drawn on their basis have been prone to various critical attacks (e.g., Brown, 1965), research with both animals and humans has assembled sufficient empirical evidence to accept these early claims (e.g., Anderson, 1994; Anderson & Revelle, 1982; 1983; Anderson, Revelle & Lynch, 1989; Broadhurst, 1957, Duffy, 1962; Easterbrook, 1959; Hebb, 1955; Heckhausen & Strang, 1988; Humphreys & Revelle, 1984; Short & Sorrentino, 1986).

Furthermore, research on the relationship between arousal and performance has also focused on illuminating the mediating processes involved, resulting in different explanatory approaches. Schneider, Wegge and Konradt (1993) have contended that although overarousal can benefit the speed of exerting a specific behaviour, at the same time it can increase the number of mistakes made, thus impeding performance. Empirical support of this explanation has been brought with a study on the processes involved in the exertion of complex motor behaviour (Heckhausen & Strang, 1988). In this study participants received different arousal-inducing instructions for dribble-shooting a basketball (i.e., normal vs. record performance demand). Compared with the lower arousal-inducing condition (i.e., normal performance condition), in the higher arousal-inducing condition (i.e., record performance condition) the lactat concentration in the participants' blood was higher, the number of attempted shots increased, as did the number of dribbling errors, and the hit rate decreased⁵⁶.

For memory-related tasks, different mediating processes have been discussed for the potential deteriorating effects of arousal on performance (e.g., Anderson & Revelle, 1982; 1983; Anderson, Revelle & Lynch, 1989; Easterbrook, 1959; Humphreys, Lynch, Revelle & Hall, 1983; Humphreys & Revelle, 1984). The upshot of the different accounts available is that

⁵⁶ In addition, the results obtained by Heckhausen and Strang (1988) showed that action-oriented individuals were tendentially more able to escape the deteriorating effect of high arousal on performance than state-oriented individuals.

high levels of arousal lead to information processing impairment. The empirical evidence available seems to support in particular the explanation that heightened states of arousal decrease the ability to keep information readily available (for instance through rehearsal or other cognitive strategies) in working memory for further processing. Hence, the greater the working memory load (that is the more difficult the task), the more likely it is that arousal will impede on performance.

Applying the outlined research on arousal effects to the reversed effect of explicit quality information under high relevance, the following account might be developed. The information that the curricular change would be introduced at the students home university in the upcoming semester might have created a higher state of arousal in these students compared to the two other relevance conditions (i.e., moderate and low relevance). Now, combining this high relevance information additionally with the explicit positive quality information about the instructional medium might have resulted in an additional rise of students' arousal state compared to the combination of high relevance with explicit negative quality information. This further arousal increment might have surpassed the optimal level and, hence, might have hampered students in exerting different cognitive processing strategies to retain the new learning content in their working memory. This may have brought about the achievement decrease. Of course, future research must empirically validate this final account. But the present data is in line with this explanation. The details of potential future research investigations into the reversed quality information effect will be further elaborated in the following general discussion.

10. General Discussion

Overall, the four experiments conducted have brought ample evidence that quality information about an instructional medium can affect students' self-regulated learning outcomes. Furthermore, the results have also pinpointed the significant moderating and mediating processes that work to bring about such quality information effects. This final chapter will focus on the different theoretical and practical implications of the findings made.

First, the experimental series' sum of evidence will be discussed in terms of its implications for the QIIM—the theoretical model on the basis of which the studies had been initially conceptualised (Section 10.1). Second, the wider theoretical and empirical implications of the experimental findings will be marked out (Section 10.2). The focus here will be on the areas of research that provided the basis for the development of the QIIM. These were research on SFP effects in education, research on self-regulated learning and research on attitude formation. Third, the very last section (Section 10.3) will shift the focus back onto a practical perspective and make suggestions how the present results might be applied to optimise everyday instructional settings (Section 10.3). At each of these three levels, vital issues in need of further inquiry will emerge. Thus, in each of the three individual sections, next steps for future research will be set out as well.

10.1 Validating the QIIM: A Summary of the Experimental Series' Results

Broadly speaking, the assembled evidence strongly supported the basic claim of this dissertation: SFP effects in self-regulated learning can be triggered by quality information about the instructional medium to be used. This was shown for both a “traditional” medium (i.e., a printed text: Experiments 2 and 3) and a “new” medium (i.e., a web-based training: Experiments 1 and 4). Most importantly, it was demonstrated that giving students explicit quality information about these instructional media

could affect both their subjective and their objective self-regulated learning outcomes (Experiments 2, 3 and 4). Provided specific moderating conditions existed, varying explicit quality information (positive vs. negative) showed an effect on students' subjective satisfaction with an instructional medium after studying and their objective performance in an achievement test on the learning content presented. Furthermore, the experimental studies also shed light on the mediating processes involved in these quality information effects (Experiments 1, 2 and 4).

Next, the explanatory model underlying the experimental series—the QIIM—needs to be evaluated in detail. The basis for this evaluation will be a thorough integrative discussion of the findings generated. So far, the results of each of the four experiments have only been discussed individually. The main function of these discussions was to deduce the consequences to be drawn from the generated evidence for the subsequent studies. The focus will now be shifted to the points of convergence and disparity across the four studies and the implications of this total evidence for the QIIM and its predictions. More specifically, the discussion will range around the following three central assumptions made by the QIIM: (1) that quality information affect students' quality expectations, (2) that quality information determine students' achievement and (3) that quality information influence students' satisfaction with an instructional medium. The discussion of all of these effects will involve pinpointing the moderating conditions involved in the generation of these phenomena. For the effects of quality information on achievement and satisfaction the significant mediators will be additionally discussed in separate sections. To highlight the implications of the empirical results and the considerations elaborated on their basis for the QIIM as stated prior to the experimental series (Figure 5.4), a comprehensive illustration of the model revisions is laid out in Figure 10.1. A stepwise description of the revised QIIM will follow immediately.

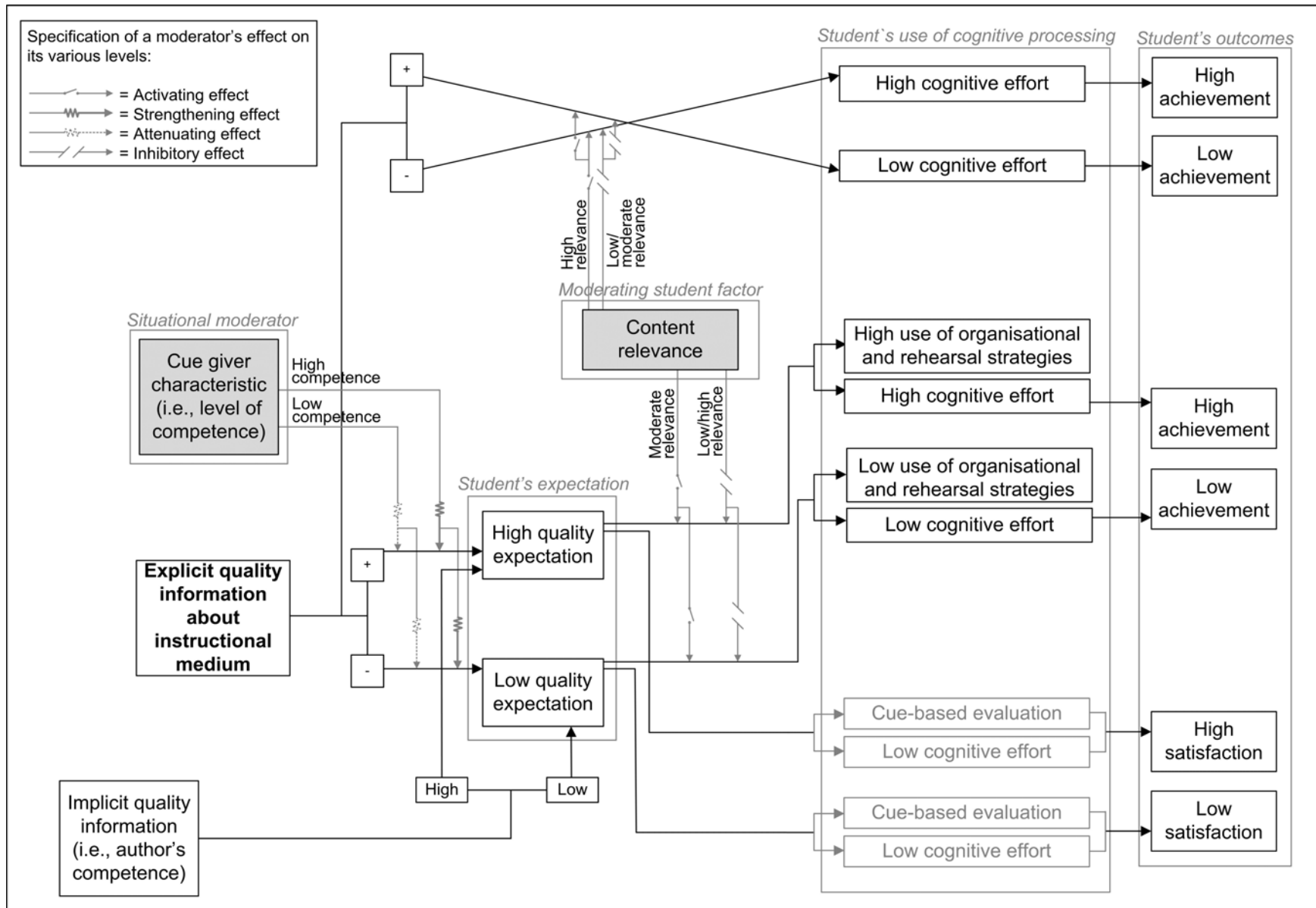


Figure 10.1
The QIIM revised according to the results obtained within the experimental series

The development of quality expectations. The first experiment focused on the significant primary step postulated by the QIIM for the generation of SFP effects on the basis of quality information about an instructional medium: the rise of students' quality expectations. Explicit and implicit quality information were confirmed to have a significant differential impact on students' quality expectations about different fictitious web-based trainings on web-page design. Informing the students that one of these web-based trainings had been judged high in quality resulted in higher quality expectations compared to the information that this medium had been rated low in quality. Likewise, telling students that one of these web-based trainings had been authored by a person highly competent in the subject matter concerned—presenting an implicit quality cue—brought about a significant increase in students' quality expectations compared to the information that the author occupied only a low competence status. The sizes of these two different quality information effects ranged between moderate and strong.

In addition to the different kinds of quality information, Experiment 1 also investigated the moderating function of the level of competence of the person giving the quality cues. The results confirmed an interaction of the cue giver's competence level with the explicit quality information supplied: Given high cue giver competence, the influence of explicit quality information was stronger than given low cue giver competence. The size of this interaction effect approached the moderate range.

As the effects of explicit and implicit quality information on students' quality expectations were predicted a priori by the QIIM (see Figure 5.4), these postulations were retained in the revised QIIM shown in Figure 10.1 (see lower left hand corner). For the interaction between these two factors, the QIIM had stated two alternative experimental hypotheses, suggesting either an ordinal interaction or no interaction between implicit and explicit quality information. As no interaction effect could be identified within Experiment 1, the suggested moderating function of implicit quality information on the effect of explicit quality information was excluded from

the revised QIIM. Again, this model revision can be inferred from Figure 10.1. Concerning the two alternative hypotheses about the moderating function of the cue giver's level of competence for the explicit quality information effect, an attenuating influence of low cue giver competence (in comparison to high cue giver competence) could be observed. Initially, the QIIM had stated either an attenuating or an inhibitory effect of low cue giver competence and, vice versa, a strengthening or activating effect of high cue giver competence (see Figure 5.4). The model specification is represented in Figure 10.1 (again in the lower left hand corner) with the attenuating and the strengthening arrows pointing, respectively, from the characteristics of the cue giver to the arrows leading from explicit quality information to students' expectations. The inhibitory/activating effect of low/high cue giver competence was excluded from the revised QIIM.

With the use of a hypothetical scenario in Experiment 1, an important question to be followed up in the subsequent experiments was whether the outlined results could be replicated in a real learning scenario. Experiments 2 and 4 succeeded in replicating the effect of explicit quality information on students' quality expectations (for details see section on the mediation of the different quality information effects below). Thus, the respective QIIM assumption was further supported. In contrast, the moderating function of the cue giver's competence level for this effect could not be replicated (Experiment 4). As such, no moderating effect of the cue giver's competence occurred for the effect of explicit quality information on either students' quality expectations or students' final learning outcomes (i.e., satisfaction and achievement with the instructional medium). Subsequently, two alternative methodological reasons for these findings will be discussed. These explanations will be central to reaching a decision about the requirement of a model revision with respect to the suggested moderating function of the cue giver's competence level.

The first obvious explanation for the missing moderating impact of the cue giver's competence level in Experiment 4 could be that the respective information manipulated might have not been salient to the participants. However, this explanation still leaves the question why the manipulation check applied in Experiment 4 still showed group differences in the expected direction. The cue giver for whom a high level of competence had been indicated was rated significantly higher in terms of his level of expertise to judge the instructional medium's quality in comparison to the cue giver for whom a low competence level had been suggested. The second alternative explanation for the lack of a moderating effect of the cue giver's competence level seems to provide a satisfying answer to this additional question. As such, it might be suggested that a confounding effect of a second source characteristic had indeed taken place in Experiment 4; but not in Experiment 1. As will be outlined forthwith, this confounding variable could have been the perceived similarity of the cue giver from the participants' point of view.

Past research has shown that the perceived similarity of a message source by the recipients can have similar effects on their attitude formation and behavioural change to the ones outlined with respect to the perceived competence of a message source (e.g., Brock, 1965; Busch & Wilson, 1976; Woodside & Davenport, 1974). For example, the study by Brock (1965) showed that a message source perceived as highly similar but low in competence provoked significant shifts in people's buying behaviour compared to a source perceived as highly dissimilar and high in competence. Although a meta-analytical study on source effects by Wilson and Sherell (1993) demonstrated that overall the manipulation of source competence produced stronger effect sizes compared to the manipulation of source similarity (i.e., 16% and 9% of total variance explained, respectively), it seems very likely that the simultaneous inverted manipulation of both of these factors (i.e., high similarity/low competence for student as cue giver vs. low similarity/high competence for professor as cue giver) brought about a reciprocal cancellation of these factors'

individual effects. Strictly speaking, although students might have perceived the first-year student giving the explicit quality information as low in expertise, at the same time they might have perceived this cue giver as highly similar, because they themselves were on average in their first year. These high similarity perceptions might have prevented the expected attenuating influence of the simultaneous low cue giver competence manipulation (in comparison to the high competence level information) on the explicit quality information effect. In Experiment 1, the student participants on average were far beyond their first year (i.e., average enrolment time: 6.14 semesters) and thus should not have perceived the first year student cue giver as similar to themselves. This allowed the occurrence of the observed moderating function of the cue giver's level of competence for the effect of explicit quality information.

To conclude, the missing interaction effect between explicit quality information about an instructional medium and the cue giver's competence might be attributed to the methodological procedure taken in Experiment 4. Until future investigations have examined this issue anew with a refined procedure, the moderating influence of the cue giver's level of competence on the explicit quality information effect on students' self-regulated learning processes and outcomes will be retained within the revised QIIM (see Figure 10.1). Future studies, therefore, will have to pay particularly close attention to the clear differentiation of the various characteristics of the cue giver potentially influencing the target population. In order to separate effects, measures of perceived similarity as well as perceived competence might be included.

Now, despite the lack of replication of the moderating impact of the cue giver's competence, the last three experiments succeeded in generating pivotal evidence for the three main assumptions of the QIIM: Explicit quality information about an instructional medium impacts on (1) students' quality expectations, (2) students' achievement and (3) students' satisfaction with an instructional medium. We will now turn to the summary of the results on these different quality information effects on

students' final learning outcomes, whereby the quality information effect on students' quality expectations will be dealt with when discussing the mediation of the two other quality information effects.

Explicit quality information effects on achievement. Overall, the results of the three experiments investigating this issue—Experiments 2, 3 and 4—supported the QIIM's central assumption that explicit positive quality information (compared to respective negative information) has a beneficial influence on students' achievement, if students cannot be entirely sure whether or not a learning content will be of future use to them (i.e., moderate content relevance). In Experiment 2, the suggested personal relevance of the learning content to the students was held constant at this relevance level. A rise in students' achievement due to explicit positive quality information about the instructional medium compared to explicit negative quality information was established. The effect size of these group differences was moderate.

Experiment 3 was in essence a replication of Experiment 2, extended with a low content relevance level. However, as verified with the respective treatment check, the experimental manipulation of the factor content relevance (low vs. moderate) in Experiment 3 was not successful: Students' self-reported relevance perceptions of the learning content in the moderate relevance condition were not significantly higher than the ones reported by students in the low relevance condition. The means of students' relevance perceptions in both conditions did not differ from each other and suggested that students in both experimental groups had studied under moderate relevance conditions. Taking this result into account, the reoccurrence of the effect of explicit quality information with no interaction between explicit quality information and content relevance was in line with the experimental hypotheses. As in Experiment 2, the size of the explicit quality information effect was moderate. It is important, however, to draw again attention to the fact that reanalysing the data with a new quasi-experimental relevance factor established on the basis of students' treatment check scores (i.e., higher vs. lower relevance

perceptions) revealed an interesting pattern of results. In the reanalysis the predicted effect of explicit quality information reappeared, but an interaction between explicit quality information and content relevance was shown, too. The beneficial effect of positive quality information on achievement (compared to negative quality information) appeared only for students with higher relevance perceptions. For students with lower relevance perceptions, no differential effect of explicit quality information on achievement was shown. Although these additional results certainly had to be treated with caution for various reasons (for details see Section 8.3), the evidence gathered in the next experiment revealed the same findings for the two experimental groups, in which moderate and low content relevance had been induced successfully (as the treatment check confirmed this time).

Overall, Experiment 4 verified an interaction of content relevance (low vs. moderate vs. high) and explicit quality information (positive vs. negative) on students' achievement, but no independent impact of explicit quality information. The size of this interaction effect was small. Further inquiry reconfirmed that a beneficial effect of explicit positive quality information (compared to respective negative information) had occurred only given moderate content relevance. Under low content relevance, no effect of explicit quality information was demonstrated. Unexpectedly, a significant explicit quality information effect on students' achievement was revealed also given that the relevance of the learning content to the students was high. However, this effect was reversed in direction compared to the effect under moderate content relevance. Students who had received explicit negative quality information showed superior performance to students who had been given explicit positive quality information. The size of the effect of explicit quality information under both relevance conditions (i.e., moderate and high) was small.

At this point it should also be mentioned that content relevance showed no independent differential effect on students' achievement in Experiment 4. Also, in Experiment 3, such an effect appeared neither in the main

analysis nor in the additional reanalysis. As outlined in detail in Section 5.1.3, past research results on this issue are mixed. Thus, no specific experimental prediction was stated with regard to the main effect of content relevance on students' achievement. The present results are in line with the evidence obtained by Eccles and her associates (Eccles & Wigfield, 1995; Meece, Wigfield & Eccles, 1990; Wigfield & Eccles, 2000), showing no independent contribution from the value of a learning task for the students to their final achievement outcomes beyond the effect of students' self-oriented expectations. Since the potential main effect of content relevance had not been visualised in the graphical illustration of the QIIM in Figure 5.4, no respective changes had to be applied to the revised QIIM represented in Figure 10.1.

In view of the findings generated across Experiments 2, 3 and 4, it seems appropriate to retain the QIIM's assumptions that an achievement advancing effect of positive explicit quality information (compared to respective negative information) is generated under moderate, but not under low content relevance. Low content relevance was found to exert the predicted inhibitory impact on the influence of explicit quality information. Thus, no revision of the QIIM was required with respect to these postulates. Similar to Figure 5.4, the different effects of the low and moderate relevance levels are entailed in Figure 10.1, with the activating arrow called "moderate relevance" and the inhibitory arrow called "low relevance" pointing downwards to the arrows leading from students' expectations further onto students' cognitive processing. However, concerning the predicted inhibitory influence of high content relevance the findings of Experiment 4 required a revision of the related QIIM assumption (see Figure 5.4). Rather than inhibiting the differential effect of explicit quality information on students' achievement, under high content relevance this effect was reversed. The respective model revision is illustrated in Figure 10.1, with the activating arrow called "high relevance" pointing upwards at the crossed arrows leading from explicit quality information onto students' cognitive processing.

However, this last change must be viewed with some reservation until future studies have succeeded in replicating the reversal of the effect of explicit quality information from moderate to high content relevance. Furthermore, future research also needs to assess the suggested arousal effect explanation given to account this effect reversal (see Section 9.3 for details). This will also include inquiring further into the mediation of the reversed effect. A detailed explication of the results of a first explorative analysis of the mediation of the reversed effect of explicit quality information under high relevance as well as suggestions concerning the design of future studies on this effect and its mediation will be given in the subsequent section. But first, the results on the mediation of the confirmed effect of explicit quality information on students' achievement under moderate relevance will be discussed.

Mediation of Explicit Quality Information Effects on Achievement. An additional asset of the experimental series to be emphasised is the production of evidence on the mediation of the different effects of explicit quality information on students' achievement. First, Experiment 2 established the partial mediation of the effect of explicit quality information on students' achievement via students' quality expectations under moderate content relevance. In Experiment 3 no effect of explicit quality information on students' quality expectations was revealed; irrespective of content relevance. Thus, no test of mediation was conducted in Experiment 3. The methodological reasons were suggested to account for the lack of this quality information effect (for details see Sections 8.3). Eliminating this methodological pitfall, Experiment 4 demonstrated that the expected effect of explicit quality information on achievement under *moderate content relevance* was completely mediated via the following three-path indirect effect: Compared to negative explicit quality information, positive explicit quality information led to higher quality expectations of the students, in turn increasing the amount of cognitive effort invested by them. This cognitive processing difference finally produced higher achievement levels for this student group. In view

of these results, the mediational sequence suggested by the QIIM—entailing quality expectations and cognitive effort investment in succession (see Figure 5.4)—can be seen as sufficiently supported. The corresponding postulates were thus retained in the revised QIIM (see Figure 10.1).

In addition to cognitive effort, the QIIM assumed a second covert behavioural factor to be involved in the mediation of the effect of explicit quality information on students' achievement: the particular learning strategies students use (see Figure 5.4). The results of Experiment 4 only partially confirmed the QIIM's assumptions concerning the mediational function of students' use of deep learning strategies for the explicit quality information effect under *moderate relevance*. The results revealed that under this relevance condition explicit quality information about the instructional medium to be used impacted upon students' use of organisational strategies, but not on students' use of elaboration strategies. The use of elaboration strategies, thus, was discarded as a potential mediator. Although it was successfully demonstrated that students' use of organisational strategies was significantly positively associated with students' quality expectations, no significant relationship was revealed between this type of learning strategy and students' final achievement. Hence, the suggested mediational power of organisational strategies was also discarded. An explorative analysis demonstrated a similar result for students' use of surface learning strategies (i.e., rehearsal strategies). Under *moderate relevance*, students' use of rehearsal strategies was significantly and positively associated with both the explicit quality information supplied and students' quality expectations. But no relationship was present between the use of rehearsal strategies and students' final achievement.

In view of these findings, the following implications were drawn for the revised QIIM (Figure 10.1). First, the use of elaboration strategies is not anymore assumed to be involved at all in the effect of quality information under moderate relevance. Second, the impact of quality information on

students' use of organisational strategies under moderate relevance can be retained. However, the postulated indirect effect of quality information via students' organisational learning strategies use needed to be removed. This change is represented in Figure 10.1 with the lacking arrow pointing from students' use of learning strategies to students' final achievement outcome. Finally, the effect of quality information on the use of surface strategies was additionally incorporated under this relevance condition. Now, of course, the outlined evidence and model revisions must be seen as pending further replication. As discussed earlier (for details see Section 9.3), it might be that if a different approach of assessing learning strategies would have been taken, different results might have been obtained. To briefly recapitulate, the work of Artelt (1999; 2000) suggests that observational methods might be preferable to the use of students' self-reports. Thus, future studies could reinvestigate the mediational role of learning strategies for the effect of quality information, using Artelt's approach.

Now as outlined in the above section on the results generated on quality information effects on achievement, Experiment 4 also pinned down an unexpected reversed effect of explicit quality information on students' achievement. This effect appeared only when the learning content was suggested to be highly relevant to the students. Following the reversed explicit quality information effect up with an explorative mediational analysis showed a complete mediation via students' cognitive effort investment, albeit this held only when using the objective measure of cognitive effort (i.e., the amount of notes students had made during studying). No differences appeared between the positive and the negative explicit quality information group on the subjective measure of effort investment. Similarly, no such differences appeared either in terms of quality expectations or with respect to students' self-reported use of learning strategies.

The results for the subjective measures of students' cognitive processing might be accounted for with the post-hoc suggested arousal effect

explanation for the occurrence of the reversed explicit quality information effect (see Section 9.3 for details): Due to the combination of positive quality and high relevance information students were aroused beyond the optimal level. Thus, most likely, they have tried very hard, but were still hampered in their information processing by this overarousal. This resulted in the high scores on the various subjective measures of these students' cognitive processing use, but in the low scores on the objective measure of their cognitive effort investment (compared to students who had received high relevance information but negative explicit quality information about the instructional medium). Furthermore, this information processing deterioration ultimately impeded this student group's achievement (compared to students in the high relevance/negative quality information group).

On the basis of these results, a further model revision was added regarding the mediation of the unexpected reversed effect of explicit quality information under high relevance. As Figure 10.1. shows, under this condition, explicit quality information is now assumed to directly trigger different levels of cognitive effort invested into learning, leading in turn to different achievement levels. More specifically, explicit negative quality information will bring about an increment in the amount of effort spent and, hence, benefit students' achievement in comparison to explicit positive quality information.

Future research needs to verify empirically the outlined arousal effect explanation to account for the reversed SFP effect under high content relevance. One pressing issue thereby will be to test whether information about a learning content's relevance and an instructional medium's quality have the suggested joint effect on students' arousal levels. It should be found that combining explicit positive quality and high content relevance information would result in higher levels of arousal than the combination of explicit negative quality and high content relevance information. Furthermore, the mediating function of students' arousal levels on their cognitive processing and final achievement must also be

further investigated. If explicit positive vs. explicit negative quality information should induce different levels of arousal under high content relevance, these differences in arousal should further affect students' information processing, ultimately determining students' achievement. Commonly, arousal is measured using physiological markers, yet studies interested in students' learning processes have preferred the use of self-report questionnaires (e.g., Thayer's [1986] Activation-Deactivation Adjective Check List used for instance by Schiefele & Krapp, 1996). Future studies might want to combine these different approaches. If confirming evidence is generated, the arousal effect explanation will need to be added to the revised assumptions of the QIIM. Moreover, if subsequent studies should again find that students' quality expectations are not involved in the generation of the reversed effect of quality information under high content relevance, an important issue to be discussed is whether or not this effect still should be designated as a SFP phenomenon.

The explicit quality information effect on satisfaction. Overall, the results of the experimental series (Experiments 2, 3 and 4) brought some evidence that explicit quality information exert a differential effect on students' satisfaction with an instructional medium after having studied with it. More specifically, Experiment 2 established that explicit quality information had some effect on students' satisfaction ratings for a printed text, given that the learning content was moderately relevant to the students. This effect favoured students' who had received positive quality information as compared to respective negative information. But the observed differences did not reach a statistical level of significance. Taking into account the small sample size used in Experiment 2, however, the fact that the effect size approached the moderate range still indicated the practical meaningfulness of these differences. Using bigger sample sizes, Experiments 3 and 4 pinpointed significant differences between the two explicit quality information groups in terms of students' satisfaction ratings for both a printed text and a hypertext. The size of these effects ranged between small and moderate. The differences in terms of students'

satisfaction existed across the levels of content relevance suggested to the students. This evidence can be judged in line with the QIIM.

Similarly in accordance with the experimental hypotheses, it was found that students' satisfaction with an instructional medium was not affected by the suggested relevance of the learning content per se (Experiment 3 and 4). However, inconsistency with the QIIM appeared in Experiment 4 for the postulated moderating impact of a learning content's relevance to the students. Whereas no such moderation effect was predicted to occur in Experiment 2 and 3⁵⁷, in Experiment 4 an interactive effect between content relevance (i.e., low vs. moderate vs. high) and explicit quality information (i.e., positive vs. negative) on students' satisfaction ratings was predicted. More specifically, it was expected that students would show different levels of satisfaction due to the differing explicit quality information given low and moderate, but not given high content relevance. This moderating influence could not be verified. Students' satisfaction ratings were affected by the initial quality cue given, irrespective of the relevance of the learning content suggested to them.

The lacking moderator role of content relevance seems particularly surprising, since satisfaction clearly represented the construct most closely related to the construct of attitude. Thus, students' satisfaction should have been the variable most safely predicted by the ELM-derived hypotheses underlying the QIIM. A possible account for this finding might be derived from the consideration that the present situation still represented a different application context compared to the common application context of the ELM. Strictly speaking, whereas the context of application of the ELM entails persuasive communication situations, the current setting had a clear emphasis on knowledge acquisition (for a detailed outline of the similarities and differences between attitude formation and knowledge acquisition and the processes involved therein

⁵⁷ The reason why no such moderation effect was expected in Experiments 2 and 3 was that Experiment 2 kept the factor content relevance constant at the moderate level and Experiment 3 aimed to induce only a low and a moderate content relevance level.

see Section 5.1.5 and Section 5.1.6). Due to this emphasis, the process of knowledge acquisition probably consumed so much of students' cognitive effort that no cognitive effort was left for students to build up an evaluation of the instructional medium used (i.e., students' satisfaction) on the basis of central processing. In other words, since students were instructed that they had to study with the instructional medium and were asked questions concerning the learning content afterwards, they might have always used peripheral processing to arrive at an evaluative judgment of the instructional medium. Hence, different results are to be expected when the situational emphasis would be turned from studying with an instructional medium to evaluating it.

For the application context currently in focus, the results concerning the effect of explicit quality information and its moderation still required an adaptation of the QIIM stated a priori in Figure 5.4. Rather than being moderated by the level of content relevance suggested to the students, the effect of explicit quality information on students' satisfaction with the instructional medium is now seen as independent of the suggested moderator content relevance. This change can also be deduced from Figure 10.1, with *no* arrows pointing downwards from content relevance to the arrows leading from quality expectations to students' cognitive processes.

Mediation of the Explicit Quality Information Effect on Satisfaction. Evidence for the mediating role of students' quality expectations for the effect of explicit quality information on students' satisfaction with the instructional medium used was produced only in Experiment 4. Experiment 2 showed no effect of explicit quality information on students' satisfaction ratings. Thus, despite the fact that a strong positive relation between explicit quality information and students' quality expectations existed, it did not seem adequate to conduct any mediation analysis in this case. As already mentioned above with respect to the results concerning students' achievement, Experiment 3 did not demonstrate the effect of explicit quality information about the instructional medium used on students'

quality expectations—probably due to some methodological reason. Revising the methodology according to the reason assumed, Experiment 4 succeeded in showing the involvement of students' quality expectations in the mediation of the effect of explicit quality information on their levels of satisfaction. However, only a partial mediation effect was established. Therefore, it can be assumed that some of the effect of explicit quality information on students' satisfaction must have been direct⁵⁸.

The mediating cognitive processing variables suggested by the QIIM to underlie the effect of explicit quality information on students' satisfaction ratings (i.e., evaluation strategies and related cognitive effort investment) were not investigated, because the present focus was on the cognitive processes involved in learning the content of an instructional medium and not on the processes operating towards an evaluation of the instructional medium and its content. Nonetheless, as outlined above the fact that explicit quality information was continually found to impact on students' satisfaction suggested that students always used cue-based evaluation strategies and low cognitive effort investment to arrive at an evaluation of the instructional media used. Therefore, it seemed necessary to eliminate content-based evaluative processes and related high effort investment as significant mediators. In the revised QIIM, the use of cue-based evaluation and related low effort investment are designated as mediating factors. To highlight that this revision was based on indirect evidence only, this change has been turned grey in Figure 10.1.

Summary. On the basis of the total evidence obtained across the four experimental studies, it can be concluded that the most essential postulate of the QIIM can be accepted: The learning outcomes students realise with an instructional medium can depend on the particular explicit quality information the students receive about this medium at the beginning of the learning event. Furthermore, on a broader level, the

⁵⁸ In order to restrict the visual complexity of Figure 10.1, it does not entail the differentiation between complete and partial mediational function.

current results are congruent with the following general rationale underlying the QIIM. Any SFP effect represents a highly complex phenomenon, dependent on vital moderating conditions opening up different mediating path ways for the occurrence of such an effect. But also on a more specific level, most of the QIIM's assumptions about the moderating conditions and mediating factors involved were corroborated. As such, the learning content's relevance to the students was confirmed as a significant moderator of the explicit quality information effect on students' final achievement. Furthermore, it was established that a complete mediation of this effect had taken place through students' quality expectations and cognitive effort invested into learning in succession. Besides, students' quality expectations were shown to exert a partial mediational function for the explicit quality information effect on students' final satisfaction with an instructional medium.

The issues, which were pinpointed in need for future investigation are as follows. First, research should look further into the reversed effect of explicit quality information on students' achievement given high content relevance and the mediation of this effect. Second, the role of learning strategies in the mediation of explicit quality information effects on students' achievement given moderate content relevance has to be followed up. The third potential area of future inquiry is the moderating role of the cue giver's competence for the different explicit quality information effects. Based on the results generated by studies concerned with these matters, several further adaptations of the QIIM might ensue.

10.2 Continuous Theoretical and Empirical Conclusions

The preceding section has outlined the implications of the experimental series' findings for the theoretical model developed to account for the effect of quality information about an instructional medium on students' self-regulated learning outcomes. Beyond the particular consequences for the QIIM's predictive assumptions, the evidence generated also carries notable implications for the different theoretical backgrounds, which together

represented the broader frame of reference for the QIIM's development. These were, first of all research on SFP effects in education, second, research on self-regulated learning and third, research on attitude formation. In the following, the conclusions to be drawn from the current results for these different research areas will be delineated.

Research on SFP effects in education. The present investigation might be seen as an important contribution to researchers' contemporary understanding of the role students can play in the generation of SFP effects in education. As has been extensively laid out in Chapter 2, so far little attention has been paid in this area to students' intrapersonal processes, which operate to realise such effects. Instead, the major thrust of work has focused on the mediating function of interpersonal processes occurring between teachers and their students. For instance, with respect to the SFP effect appearing most closely related to the present phenomenon investigated—the effect of information about a teacher's competence—the mediational explanation put forward was as follows. Due to differing information about the teacher's competence and respective expectations generated on this basis by the students, the students differentially changed their classroom behaviour, in turn producing different instructional behaviour of their teacher. These differences in teacher behaviour ultimately fed back to produce different student performances (e.g., Feldman & Prohaska, 1979). The majority of explanations suggested to account for the classic SFP effect of teachers' expectations focused on similar interpersonal behavioural changes (e.g., Jussim, 1986; Rosenthal, 1981). As has been already pointed out in Chapter 2, the prevailing bias against intrapersonal student variables might be to some extent due to the fact that the few studies investigating this aspect were only moderately successful. As such, it was found that specific intrapersonal student variables (i.e., students' self-oriented expectations) can contribute not much to the prediction of SFP effects of teachers' expectations (e.g., Jussim, 1989).

The outlined results demonstrated how a SFP effect in terms of students' self-regulated learning outcomes could be solely generated via an intrapersonal path way, involving only students' expectations and/or students' cognitive processing of the learning content. Furthermore, it might be suggested that the explanatory intrapersonal model developed to account for the present SFP phenomenon—the QIIM—might also serve to account for specific SFP effects triggered by students' expectations in teacher-regulated learning. For instance, it might be that rather than causing different instructional behaviours of their teacher, students' expectations about a teacher's competence might result in different amounts of students' cognitive effort investment into learning, affecting in turn students' achievement and satisfaction with the teacher. However, on the basis of the current results, no statement can be made whether the QIIM's predictions will hold in this different instructional setting.

Besides the specific implications for the domain of research on SFP effects in education, the present investigation might also encompass a vital contribution for the research area of SFP effects more generally. Although a reversed effect was not expected on the basis of the theoretical frameworks consulted for the development of the QIIM, Experiment 4 revealed such an effect. As the following quote illustrates, Merton (1949)—the founding father of the concept of SFP—indeed had already in his earlier writings specified such an effect, terming it the suicidal prophecy effect:

“...‘suicidal prophecy’...involves beliefs which prevent fulfillment of the very circumstances which would otherwise come to pass. Examples of this are plentiful and familiar. Confident that they will win a game or a war or a cherished prize, groups become complacent, their complacency leads to lethargy, and lethargy to eventual defeat.” (Merton, 1949, p. 128)

A few sentences later, Merton (1949) makes a call for inquiring into the conditions under which these different kinds of SFP effects will occur. As will be outlined next, only a few studies in the area of research on SFP effects generally, and education in particular, have been concerned with

the occurrence of reversed SFP effects and the important moderating conditions involved.

Across the enormous amount of research on SFP effects in education, only three very early experimental studies have reported reversed SFP effects (Anderson & Rosenthal, 1968; Babad, 1977; Means & Means, 1971). Focusing on the population of mentally retarded students, the study by Anderson and Rosenthal (1968) showed that inducing positive performance expectations in the teacher about some students (compared to inducing no such expectation) actually decreased the performance of these students. Babad (1977) also found such a reversed teacher expectation effect for mentally retarded students, but only for those who could be classified on the basis of their actual developmental potential as “true high potentials”. The authors speculated that this reversed effect might have been due to a loss of the feeling of being challenged and a resulting decrease in these students’ effort expenditure. An alternative teacher-focused explanation might be available with Brophy and Good’s (1974) concept of teacher proactivity. These authors suggested that some teachers’ might reverse the effect of their negative student-oriented expectations, since such expectations trigger certain compensatory instructional behaviours in those teachers.

Means and Means (1971) brought evidence that a reversal of SFP effects in education is also possible for the population of “normal” students. With similarity to the study by Babad (1977), their study showed that high achievers experienced a significant outcome benefit from the induction of negative rather than positive self-oriented expectations. Vice versa, for low achievers an outcome increase followed from having positive self-oriented expectations (compared to respective negative expectations) induced. However, no explanation was provided by the authors for this complex pattern of results. Taking over the explanation given for the reversed effect of positive teacher expectations on the performance of mentally-retarded children presented by Babad (1977), it could be suggested that the high achievers were more challenged to invest effort in the task by negative self-

oriented expectations compared to respective positive expectations. Conversely, the low achievers were more challenged by the positive self-oriented expectations compared to respective negative expectations.

In research on SFP effects generally, evidence on reversal of expectancy effects is similarly scarce. One of the few exceptions is a study by Bond (1972), showing that women who had been expected to be cool and aloof—due to some prior information given to their interaction partner—were actually observed to be warm and talkative. Similarly, a later study by Swann and Snyder (1980) also identified a reversed SFP effect. Participants, who were expected by an instructor to be low in ability to perform a card trick, were more successful in actually doing the trick than participants expected to be high in ability. However, this was only the case, if the instructor believed that performing the card trick was a matter of personal ability. If the instructor believed that performance was a matter of instructional practice, participants who were expected to have high ability outperformed the ones expected to have low ability. Furthermore, the reason for this moderating function of the instructors' theory of ability was shown to lie within the mediation of these two different types of SFP effects. In dependence on their theory of ability, the instructors either used their most effective teaching strategies with the students expected to be high in ability (SFP effect), or with the students expected to be low in ability (reversed SFP effect). Thus, similar to Brophy and Good's (1974) teacher proactivity account, Swann and Snyder's explanation focused on factors involved on the part of the instructor in the moderation of reversed SFP effects.

To sum up, past research on SFP effects generally and in education particularly has put little effort into inquiring about the conditions for the reversal of these effects. Furthermore, empirically based student-focused explanations of the mediation and moderation of these effects in the educational context are completely missing. Although the studies outlined cannot be directly related to the present research issue in focus, they definitely emphasise the need for future inquiry. This point is also made in

a recent review of the current state of research on SFP effects by Olson et al. (1996). Almost half a century after Merton's call for research stated above, these authors still have to conclude that existing studies only "...underscore an important direction for research on self-fulfilling prophecies—the identification of factors that moderate whether confirmation or disconfirmation is likely." (Olson et al., 1996, p. 223). The findings from Experiment 4 might be seen as one further step towards this objective, whereby the focus is, of course, on one particular phenomenon— effects of quality information about an instructional medium. Certainly the results at hand cannot, and should not, be generalised to other SFP phenomena. Furthermore, because of the lacking of an a priori specification of the reversed effect of explicit quality information under high content relevance, as outlined above future research must first establish the replicability of this effect. Only then a final conclusion can be drawn with respect to the robustness of this phenomenon.

Research on self-regulated learning. As has been outlined in Chapter 3, research on self-regulated learning has also not been concerned with the effect of students' expectations concerning the quality of an instructional medium or the role of situational cues in triggering such expectations. Across the various models dominating current research approaches in this area, the factor quality information about the instructional medium to be used is at best accounted for within a box labelled instructional cues (e.g., Winne & Hadwin, 1998; see Puustinen & Pulkkinen, 2001 for a review of four of the most prevalent models on self-regulated learning). Furthermore, if students' task perceptions are considered at all in those models, this variable is underspecified in terms of its effects on students' self-regulated processes and outcomes. Thus, no adequate basis was presented by research on self-regulated learning for arriving at specific predictions concerning the effect of quality information about an instructional medium. The evidence produced might be taken as an

important extension of existing models regarding the role of situational task factors for students' self-regulated learning processes and outcomes.

Besides, the experimental studies presented might also be appreciated for specifying and integrating the explanations put forward for the results brought by studies on stereotyping processes in computer-based learning (Alvarez-Torres et al., 2001; Mayer et al., 2003; for details on these studies and the different explanations put forward by the various authors see Section 3.2.2). As suggested before, in view of the results produced in the experimental investigations by Fries et al. (in press), these researchers might have not investigated a specific cultural stereotyping phenomenon, but rather a much more general effect: the effect of quality information about an instructional medium and respective students' expectations. Based on the present findings the following mediating path way underlying the effects produced by Alvarez-Torres and his co-workers and by Mayer and his co-workers may now be specified: First, the different country of origin cues might have provoked different quality expectations about the instructional medium in the students and then these different expectations could have elicited varying amounts of cognitive effort put by the students into learning with this medium, which finally determined the levels of achievement that the students demonstrated. If the findings of Alvarez-Torres et al. and Mayer et al. are explained in this way, it can further be assumed that a moderating influence of the factor content relevance plays an important role in triggering such an effect, too.

Research on attitude formation. The final research area for which the present work can be considered to offer some notable implications is the domain of research into the formation of attitudes. Chapter 4 and Chapter 5 have advocated the usefulness of one of the most dominant models in this area—the ELM (e.g., Petty & Cacioppo, 1986a; 1986b; Petty & Wegener, 1999)—as a useful framework for further pinpointing the moderated mediation involved in the generation of the educational phenomenon under investigation. It is important to re-emphasise that the ELM was not simply used to explain quality information effects in self-

regulated learning, but rather was transformed into such a model with the use of relevant past research in the educational context. Nonetheless, the final model—the QIIM—retained the ELM’s two most essential ideas: the moderating function of content relevance and the mediating role of students’ cognitive processing for the effect of heuristic cues about the individual characteristics of an information source.

The results of the present experimental series have demonstrated that the suggested relevance of the learning content to the students exerts a significant moderating function for the effect of explicit quality information on students’ achievement in self-regulated learning. However, as has been emphasised before, this moderating function was not completely in line with the predictions. As such, the ELM-deduced hypotheses appeared to hold at the low and moderate level, but not at the high level of content relevance (for details see again Section 10.1). Furthermore, the ELM-deduced hypotheses concerning the mediational role of students’ cognitive processing for the effect of explicit quality information on students’ achievement also found empirical support (for details see Section 10.1). Students’ cognitive effort investment into learning was determined in Experiment 4 to be significantly involved in the mediation of the quality information effect, both under moderate and high relevance conditions. However, students’ deep learning strategies could not be shown to exert the proposed mediating function.

Thus, the ELM was able to make some important theoretical contributions to the explanation of the phenomenon in focus. Quite recently, other researchers have similarly suggested the usefulness of the ELM as a theoretical framework for a range of different phenomena occurring during students’ knowledge acquisition (Dole & Sinatra, 1998; Dickhäuser & Reinhard, *in press*; Kardash & Scholes, 1996; Murphy et al., 2003). Based on this evidence, the ELM might even be viewed as a useful theoretical framework for the investigation of educational phenomena on a more general level.

Despite demonstrating that the ELM can be adapted to explain psychological phenomena in the educational context, the current work also must raise a critical issue concerning the moderator content relevance. As such, in Experiments 3 and 4 some difficulties appeared with the experimental variation of this factor. This was evidenced by the manipulation check applied in both of these studies (see Section 8.2 and Section 9.2 for details). This finding might also be of importance for researchers working with the ELM in the context of attitude formation, since no manipulation check has usually been applied here so far when experimentally varying the relevance of an attitudinal issue to the participants. Within the educational context, relevance has been commonly assessed through correlational data only (i.e., students' self-reports). Future studies concerned with the construct of content relevance in both fields of research might want to further inquire into ways of manipulating students' relevance perceptions, validating the success of these treatment interventions and further explicating the mechanisms by which content relevance enacts its different moderating functions. Thereby, it might also be interesting to pay attention to the differentiation of content relevance from other related constructs and their effects, such as the importance of an issue for an individual's value system (e.g., Johnson & Eagly, 1989) or the level of enjoyment a person experiences whilst performing a task (e.g., Eccles & Wiegfield, 1995).

10.3 Regaining the Practitioner's Perspective

Besides the different theoretical implications outlined, important inferences for everyday instructional practice may also be drawn from the present research. Any self-regulated learner invariably depends on a range of instructional media available on the topic he/she wants to instruct him-/herself on (e.g., textbooks, web- or computer-based trainings or simple lecture hand-outs). Now some of these students might more or less incidentally receive explicit quality information about these various media from their teachers, fellow students or other information sources.

Sometimes students might also be left without any explicit quality information about the instructional media at hand, because some instructors might *not* explicitly point out such information—despite the fact that they have probably spent a significant amount of time on selecting or preparing these instructional media to the best of their knowledge. Even in these cases and without any other explicit quality information from other sources, it seems very likely that students will generate quality expectations about the different knowledge-delivering sources on the basis of more implicit quality cues (e.g., the assumed level of competence of the author, the publishing company or the book cover). Thus, instructors might also want to monitor closely the reputation of the instructional media used amongst their studentship.

Furthermore, based on the results at hand, the communication of explicit and implicit quality information might be recommended as a useful tool for practitioners to optimise their students' self-regulated learning outcomes. When putting forward this claim the following argument must be stressed in addition: Even if the size of the effect of explicit quality information on the most critical student outcome—achievement—was not strong but varied between moderate and small across the different studies, the practical implication of this effect can still be considered meaningful, because of the minimal manipulation needed to produce it. Or in other words, as Prentice and Miller (1992, p. 160) have put it, "...a large effect size is not the only way to demonstrate that an effect is important...importance is a function of how minimal the manipulation of the independent variable...will still produce an effect.". Besides, the large number of people affected as well as the potential costs for them should be acknowledged as further reasons, why the size of the different quality information effects demonstrated should not be the only criteria to judge their practical relevance. Strictly speaking, making quality information available commonly does not require much of the instructor, yet doing so instructors are able to affect a large amount of people at the same time (i.e., a whole classroom or a whole lecture theatre of students). Of course,

these arguments also hold for the second outcome variable, students' satisfaction with an instructional medium, for which small to moderate effect sizes were likewise observed (Experiments 2, 3 and 4).

An illustrative example of how to make use of explicit and implicit quality information about instructional media in everyday instructional practice is actually supplied within the experimental studies by Fries et al. (in press), which—as outlined earlier—provided an important empirical basis for the present inquiry (for details see Section 3.2.4). What has not been pointed out so far is that these studies were generated in a practical setting. The larger objective of these studies was the development of the very computer-based training with regard to which the quality information had been varied. This training dealt with a very difficult computer science topic—mathematical algorithms used for data compression (e.g., Pennebaker & Mitchell, 1993)—and was intended to be used as an add-on to the usual seminars on this topic. To promote students' understanding, the training entailed a visual simulation of the physical processes associated with data compression. It further allowed varying significant parameters and observing the effect of these variations in the simulation. Students received additional support through comprehensive guiding annotations and several example cases to work through. Furthermore, the training contained an introduction on how to use the training programme and a short overview of the data compression topic. The simple manipulation of the explicit and implicit quality information about this comprehensive computer-based training (i.e., high quality medium authored by the head of department vs. low quality medium authored by a student of the department) before students actually started their self-regulated learning phase determined the level of their final achievement and satisfaction with it.

Similar application opportunities within other educational scenarios might easily be thought of. As such, instructors across different contexts might use both explicit and implicit quality information for the range of available textbooks in the local libraries on a certain subject matter to be taught.

Moreover, they could make this quality information more salient by handing out simple rating lists together with their lecture handouts. Likewise, textbook authors might supply their readership with quality information about the further readings available on a certain topic.

The pivotal question now is of course, what the exact nature of the explicit or implicit quality information about an instructional medium should be, if instructors want to optimise the self-regulated learning outcomes of their target audience. On the basis of the studies by Fries et al. (in press), the following recommendation could have been put forward. The supply of positive information about the quality of an instructional medium to students increases their subjective learning outcomes (i.e., satisfaction with an instructional medium) and their objective learning outcomes (i.e., achievement). However, in view of the results obtained within the present experimental investigation, a more differentiated picture has emerged. On the basis of the new empirical evidence produced, the following conclusions can be drawn concerning the systematic use of quality information about an instructional medium.

First, explicit positive quality information will always raise students' *subjective* learning outcome: Satisfaction ratings of the instructional medium with which the students had studied were consistently higher when students had initially received explicit positive quality information compared to explicit negative quality information; irrespective of the relevance of the learning content to the students. However, the effect of explicit quality information on students' *objective* achievement appeared to depend on the relevance of the learning content presented to the students. Given low content relevance, there appeared to be little potential for optimising students' self-regulated learning achievement via quality information about the instructional medium per se. Therefore, under such conditions, instructors might first need to raise students' relevance perceptions onto a moderate level. Here possible strategies have been

outlined already in the context of Keller's ARCS-Model⁵⁹ of Instructional Design (e.g. Keller, 1983; Keller & Kopp, 1987; Newby, 1991). For example, Keller and Kopp (1987, pp. 293-294) give out the following two recommendations to increase students' relevance perceptions: (1) "Use concrete language and use examples and concepts that are related to learner's experience and values." and (2) "Provide statements or examples that present the objectives and utility of the instruction, and either present goals for the accomplishment or have the learners define them.". Having elevated the perceived relevance of the learning content by the students with such strategies, further optimisation of students' achievement can be obtained with the use of explicit positive quality information.

Now, the present results also pointed out an additional complexity in the moderating influence of content relevance on the effect of explicit quality information on students' achievement: With a high level of content relevance, explicit positive quality information might acquire an adverse effect on achievement. However, as has been mentioned previously, further research is required to develop a more comprehensive understanding of the moderating function of content relevance and the respective mediating pathways and be able to give sound practical suggestions in this respect.

Similarly, future research further needs to investigate the moderating function of different cue giver characteristics for the effects of explicit quality information. Based on the present results, it might be speculated that the quality expectations students generate on the basis of explicit quality information from a fellow student would be more pronounced if this fellow student is perceived as highly similar to themselves. If an instructor is the cue giver, the generation of quality expectations on the basis of explicit quality information provided might be strengthened

⁵⁹ ARCS is the abbreviation for attention, relevance, confidence and satisfaction, the student factors assumed by Keller and his associates (e.g., Keller, 1983; Keller & Kopp, 1987) to promote successful instruction.

through stressing the cue giver's high level of expertise. However, the moderating function of these different cue giver characteristics for the effect of explicit quality information about an instructional medium still awaits future empirical investigation.

When judging the merit of the present experimental series from a practical viewpoint, two final points of limitation also need to be highlighted. First, the current focus was on short-term learning events (i.e., maximum time 35 minutes). Likewise, the studies by Fries et al. (in press) entailed somewhat time-limited learning phases (i.e., maximum time 60 minutes). Even though short-term learning with printed texts and computer-based instructional material covers a wide range of self-regulated learning scenarios, a prolonged use of instructional media is also part of everyday instructional reality. For example, students at school use a textbook over the course of a whole year. Similarly, students at university use a digitalised lecture series or a web-based training programme over the course of one semester. Hence, an important question is, if the processes underlying the effects of quality information on students' learning outcomes will also apply to long-term learning episodes. The crux for studies following up on this question will be to determine whether quality information effects become eliminated, prevail or even become strengthened over longer periods of time. On the one hand, it seems reasonable that quality information effects accumulate over time, since sustained increased cognitive effort might result in a stronger relation between quality information and achievement. On the other hand, the effect of quality information could also become attenuated over time, since students' quality expectations might be less influenced by other's quality recommendations in the long run, but rather get attuned to the objective quality of the medium.

A second restriction of this research project to be considered is its focus on self-regulated learning processes of university students. An obvious pressing issue, therefore, is the question whether or not the documented effects on self-regulated learning would also occur for other instructional

contexts and student populations. Current research evidence maintains that self-regulated learning processes appear largely similar in instructional settings outside university, such as learning scenarios at primary and high school or in vocational learning environments (e.g., Eilam & Aharon, 2003; Eshel & Kohavi, 2003; Gaskill & Wollfolk Hoy, 2002; Perels, Guertler & Schmitz, 2005; Rozendaal, Minnaert & Boekaerts, 2001). Thus, it seems reasonable to assume that similar determinants might act upon self-regulated learning processes across different contexts and that quality information effects on achievement and satisfaction with an instructional medium would also be generated with a different context and student population in focus. Likewise, the model developed and revised in the course of this dissertation to account for such effects—the QIIM—should also hold its predictive accuracy in these different situations.

In closing this final discussion it can be consolidated that this dissertation has pinpointed the generation of SFP effects in a domain, which so far has largely stayed unrecognised by researchers and practitioners concerned with such phenomena alike: the domain of self-regulated learning. The most obvious reason pointed out why research on SFP effects in self-regulated learning has been found wanting so persistently was that theoretical explanations of SFP effects in education have centred on interpersonal mediational processes occurring between teachers and students. The empirical evidence generated has made it clear that the use of quality information about instructional media allows practitioners to take advantage of the power of SFP, even if they are not able to guide their students' learning through direct interaction. As postulated on the basis of past research, the operating mediators for such SFP effects are intrapersonal and not interpersonal in nature and are centred in the students. Furthermore, the outlined experimental series was able to demonstrate that a model taken over from attitude research can be successfully transformed into a model of intrapersonally mediated quality information effects in self-regulated learning. However, the moderated

mediation of such effects appeared more complex than assumed a priori (see Figure 5.4 and 10.1 in comparison). Thus, just as the present analysis has evinced that theoretical models from the field of social and educational psychology can be meaningfully integrated to explain SFP effects in self-regulated learning, the final discussion of the findings generated also has shown that further empirical and theoretical work is needed to complete the description, explanation and optimisation of the complex processes induced by quality information about an instructional medium on students' achievement and satisfaction when studying with this medium.

11. References

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12. Appendices

Appendix A: Experiment 1

The Effect of Explicit and Implicit Quality Information on Expectancy Generation and the Moderating Function of Cue Giver Competence (2x2x2 Within-Subjects Design)

Welchen Schulabschluss haben Sie?

Haben Sie studiert?

WEITER

Was haben sie studiert?

Bis zu welchem Fachsemester haben Sie studiert?

WEITER

Computerlernprogramme werden heutzutage immer häufiger zum Lernen genutzt. Sie befassen sich inhaltlich mit den unterschiedlichsten Themengebieten.

In vorliegender Befragung geht es um acht Lernprogramme zum Thema "Programmierung von Webseiten". Das Ziel der ausgewählten Lernprogramme ist es, den Nutzern verständlich zu vermitteln, wie Webseiten mit Hilfe der Textsprache HTML erstellt werden können. Es werden Style-Sheet-Anweisungen erklärt, die definieren, wie HTML-Elemente dargestellt werden. Dadurch lassen sich z.B. auf einfache Weise Schriftart, -farbe, -größe, der Hintergrund und die Positionierung bestimmen.

Stellen Sie sich bitte vor, Sie hätten die Möglichkeit, mit einem Computerlernprogramm zu lernen, wie Webseiten programmiert werden. Um eine sinnvolle Auswahl eines für Sie angemessenen Programms zu treffen, ist es zunächst notwendig, die Qualität einzelner Lernprogramme zu beurteilen.

Auf folgenden Seiten werden Ihnen Kurzinformationen zu acht computerbasierten Lernprogrammen zum Thema "Webseitenprogrammierung" präsentiert. Es wird außerdem jeweils ein bewertendes Statement über die Qualität jedes Lernprogramms angeführt, das entweder von Professor Dr. Jürgen Steiner oder dem Studierenden Daniel Reiter abgegeben wurde.

Dr. Jürgen Steiner lehrt seit 1987 Informatik an der Universität Tübingen. Er wurde im Jahr 2001 mit dem Landeslehrpreis ausgezeichnet, der vom Ministerium für Wissenschaft, Forschung und Kunst für die besten Lehrleistungen an baden-württembergischen Hochschulen vergeben wird. Dr. Steiner erhielt für seine Lehrtätigkeit



Lehrstuhl für Erziehungswissenschaft II
(Prof. Dr. Hofer)
Pädagogische Psychologie

Herzlich Willkommen zur Befragung "Wahrnehmung von Kurzinformationen zu Lernsoftware" !

Die vorliegende Befragung wendet sich an Studierende aller Fachbereiche. Beim Einkauf von Lernsoftware über Internetanbieter wie z.B. Amazon ist es üblich, dass dem Kunden Kurzbeschreibungen bzw. Rezensionen zu den einzelnen Lernprogrammen präsentiert werden. In der folgenden Befragung soll untersucht werden, wie sich verschiedene Informationen über ein Computerlernprogramm auf die Erwartungen der Lerner gegenüber diesem Computerprogramm auswirken. Nachdem Sie zunächst gebeten werden, Fragen zu Ihrer Person zu beantworten, werden Ihnen Kurzinformationen zu jeweils acht Computerlernprogrammen präsentiert. Ihre Aufgabe wird es sein, diese Lernprogramme anhand verschiedener Fragen zu beurteilen. Die Dauer der Untersuchung beträgt ca. 25 min. Die ermittelten Daten dienen ausschließlich der wissenschaftlichen Forschung und werden vertraulich behandelt. Die Befragung erfolgt anonym.

Als Dank für Ihre Unterstützung bieten wir Ihnen die Teilnahme an einer **Verlosung** von je **1x 30 Euro und 3 x 10 Euro** an. Die Auslosung wird voraussichtlich im November 2003 erfolgen. Die Gewinner werden per email benachrichtigt. Der Rechtsweg ist ausgeschlossen.

Falls Sie Interesse an allgemeinen Ergebnissen der Untersuchung haben, schicken wir Ihnen gerne eine kurze Zusammenfassung per email zu.

Vielen Dank für Ihre Unterstützung!

START

Ich bin:

- ☐ männlich
☐ weiblich

Alter: Jahre

WEITER

2.) Ich denke, dass ich sehr viel mit diesem Lernprogramm lernen könnte.

trifft ueberhaupt nicht zu ☐ ☐ ☐ ☐ ☐ ☐ trifft genau zu

3.) Ich schätze die Qualität des Lernprogramms als sehr hoch ein.

trifft ueberhaupt nicht zu ☐ ☐ ☐ ☐ ☐ ☐ trifft genau zu

WEITER

Lernmodul C: Webseiten selbst programmieren

Informatik-Professor Dr. Stefan Mainhard konzipierte mit wissenschaftlichen Mitarbeitern seines Informatiklehrstuhls an der **Universität Leipzig** dieses Lernmodul, um am universitätsinternen Wettbewerb "Optimierung von Lernsoftware" teilzunehmen. Das Lernprogramm erklärt, wie HTML-Seiten sinnvoll aufgebaut werden, unabhängig davon, ob es sich um die Gestaltung privater Homepages oder um professionell eingesetzte Web-Seiten handelt. Das Programm wendet sich sowohl an Anfänger als auch an fortgeschrittene HTML-Programmierer. In sechs unabhängigen Teilen werden bestimmte Themengebiete erfasst, die den Lerner mit der Materie vertraut machen. Der Referenzteil erhält schnell auffindbare Informationen zu den einzelnen HTML-Befehlen und anderen Funktionen.

Professor Dr. Jürgen Steiner (Universität Tübingen/ Gewinner des LLP 2001) bewertet das Lernprogramm wie folgt:

„Im Vergleich zu anderen Lernprogrammen ist dieses Lernmodul nicht sinnvoll aufgebaut. Wesentliche Informationen können nicht mit einem Blick wahrgenommen werden, der Bildschirm wirkt überladen. Außerdem bietet das Lernprogramm nur wenig Gelegenheit das erworbene Wissen zu reflektieren. Ob man mit diesem Modul gut lernen kann, halte ich für fraglich.“

1.) Ich erwarte nicht, dass ich mit diesem Lernprogramm Kompetenzen im Bereich der Webseitenprogrammierung erwerben könnte.

trifft ueberhaupt nicht zu ☐ ☐ ☐ ☐ ☐ ☐ trifft genau zu

2.) Ich denke, dass ich sehr viel mit diesem Lernprogramm lernen könnte.

trifft ueberhaupt nicht zu ☐ ☐ ☐ ☐ ☐ ☐ trifft genau zu

3.) Ich schätze die Qualität des Lernprogramms als sehr hoch ein.

trifft ueberhaupt nicht zu ☐ ☐ ☐ ☐ ☐ ☐ trifft genau zu

WEITER

Lernmodul D: Wie erstelle ich Webseiten?

An der **Technischen Universität in Darmstadt** wurde dieses Lernmodul unter der Leitung von **Informatik-Professor Dr. Michael Hallmann** konzipiert. Die Nutzer lernen mit diesem Programm, wie Texte, Grafiken und andere multimediale Komponenten erstellt und anschließend im Internet veröffentlicht werden. Das Lernprogramm ist sowohl für Neulinge konzipiert, die sich einen Überblick über die Programmiersprache HTML und deren Einsatzmöglichkeiten verschaffen möchten, aber auch für erfahrene Web-Publisher geeignet, die tiefergehende Hinweise zur Webseitenprogrammierung wünschen.

Daniel Reiter, der im ersten Semester Medieninformatik an der Universität Bremen studiert, gibt folgende Bewertung über das Lernprogramm ab:
„Ich bin überzeugt, dass die Studierenden nach Bearbeitung des Lernmoduls in der Lage sein werden, Webseiten effektiv zu programmieren. Texte, Graphiken und Animationen sind sinnvoll aufeinander abgestimmt und motivieren zu einer intensiven Auseinandersetzung mit dem Thema. Außerdem bietet das Programm weiterführende Informationen für fortgeschrittene Nutzer an. Das Lernmodul stellt eine gelungene Bereicherung webbasierter Lernprogramme dar.“

1.) Ich erwarte nicht, dass ich mit diesem Lernprogramm Kompetenzen im Bereich der Webseitenprogrammierung erwerben könnte.

trifft ueberhaupt nicht zu ☐ ☐ ☐ ☐ ☐ ☐ trifft genau zu

2.) Ich denke, dass ich sehr viel mit diesem Lernprogramm lernen könnte.

trifft ueberhaupt nicht zu ☐ ☐ ☐ ☐ ☐ ☐ trifft genau zu

3.) Ich schätze die Qualität des Lernprogramms als sehr hoch ein.

trifft ueberhaupt nicht zu ☐ ☐ ☐ ☐ ☐ ☐ trifft genau zu

WEITER

Lernmodul E: Effektiv Webseiten programmieren

Dieses Lernmodul wurde von den **Informatik-Studenten Rene Fischer und Andreas Krull während ihres ersten Semesters an der Technischen Universität Berlin** in der Veranstaltung „Webseiten-Programmierung“ entwickelt. Anhand der praktischen Arbeit mit Texten, Listen, Verweisen und Tabellen können die Nutzer die Techniken der Webseitengestaltung mit HTML praxisnah erlernen. Den Anforderungen verschiedener Lerntypen wird dabei durch eine Unterteilung in entsprechende Abschnitte Rechnung getragen. Das Programm bietet Fortgeschrittenen weiterführende Informationen z.B. zu Frames, Multimedia und Applets, Graphiken, Counters, Style Sheets usw. Es werden Tipps und Tricks zu Graphiken und zur Textgestaltung gegeben.

Daniel Reiter, der im ersten Semester Medieninformatik an der Universität Bremen studiert, gibt folgende Bewertung über das Lernprogramm ab:

„Meine Beurteilung des Lernmoduls fällt eher negativ aus. Ich schätze, dass viele Studierende Verständnisprobleme haben werden. Die Inhalte werden teilweise sprachlich kompliziert präsentiert. Fachbegriffe werden nicht ausreichend erklärt und es ist keine Hilfefunktion vorhanden. Das Lernmodul dürfte daher eher eine abschreckende Wirkung haben, anstatt dazu zu motivieren, sich mit dem Thema weiter auseinander zu setzen.“

1.) Ich erwarte nicht, dass ich mit diesem Lernprogramm Kompetenzen im Bereich der Webseitenprogrammierung erwerben könnte.

trifft ueberhaupt nicht zu ☐ ☐ ☐ ☐ ☐ ☐ trifft genau zu

2.) Ich denke, dass ich sehr viel mit diesem Lernprogramm lernen könnte.

trifft ueberhaupt nicht zu ☐ ☐ ☐ ☐ ☐ ☐ trifft genau zu

3.) Ich schätze die Qualität des Lernprogramms als sehr hoch ein.

trifft ueberhaupt nicht zu ☐ ☐ ☐ ☐ ☐ ☐ trifft genau zu

WEITER

Lernmodul F: Webseitenprogrammierung leicht gemacht

Im Rahmen des Projektes „Lernsoftware zur Webseitenprogrammierung“ erstellten **Katrin Janner und Larissa Kaiser** dieses Lernmodul. Sie studieren im **zweiten Semester**

Medieninformatik an der Hochschule für Wirtschaft und Technik in Dresden. Das Lernprogramm ist als Crashkurs konzipiert. Es führt die Lerner Schritt für Schritt in die Grundlagen der Webseiten-Programmierung ein. Behandelt werden grundlegende Konzepte und Tags für Textauszeichnungen, Graphiken und Strukturen wie z.B. Listen. Ansprechende Gestaltungshinweise helfen den Nutzern bei der Erstellung attraktiver Hypertext-Angebote.

Daniel Reiter, der im ersten Semester Medieninformatik an der Universität Bremen studiert, gibt folgende Bewertung über das Lernprogramm ab:

„Die einzelnen Arbeitsschritte des Lernmoduls sind so dargestellt, dass man leicht die abschließenden Aufgaben lösen kann. Dadurch, dass der Lernablauf individuell variiert werden kann, ist das Lernprogramm an unterschiedliche Leistungsniveaus angepasst. Das Lernmodul ist inhaltlich überzeugend gestaltet, so dass ich dem Lernprogramm eine hohe Erfolgsquote prognostiziere.“

1.) Ich erwarte nicht, dass ich mit diesem Lernprogramm Kompetenzen im Bereich der Webseitenprogrammierung erwerben könnte.

trifft ueberhaupt nicht zu ☐ ☐ ☐ ☐ ☐ ☐ trifft genau zu

2.) Ich denke, dass ich sehr viel mit diesem Lernprogramm lernen könnte.

trifft ueberhaupt nicht zu ☐ ☐ ☐ ☐ ☐ ☐ trifft genau zu

3.) Ich schätze die Qualität des Lernprogramms als sehr hoch ein.

trifft ueberhaupt nicht zu ☐ ☐ ☐ ☐ ☐ ☐ trifft genau zu

WEITER

Lernmodul G: Grundlagen der Webseitenprogrammierung

Jochen Bannet, der im ersten Semester Erziehungswissenschaft mit **Studienschwerpunkt Medienpädagogik** an der **Pädagogischen Hochschule in Freiburg** studiert, entwickelte dieses Lernmodul im Rahmen der Übung "Erstellung von Webseiten". Mit diesem Modul lernen die Nutzer systematisch nahezu alle HTML- und CSS-Elemente kennen. Die Lerner erfahren, wie Bilder, Texte und Multimedia- Dateien sowie Plug-Ins erstellt und eingesetzt werden. Außerdem erhält der Nutzer Informationen darüber, wie ansprechende Framesets, Tabellen oder komplexe Layoutgruppen aufgebaut werden.

Professor Dr. Jürgen Steiner (Universität Tübingen/ Gewinner des LLP 2001) bewertet das Lernprogramm wie folgt:
„Es werden nur sehr wenige Hinweise gegeben, wie die dargelegten

Inhalte in der Praxis umzusetzen sind. Zur Verdeutlichung sollten mehr Beispiele und Übungsaufgaben eingefügt werden. Das Programm ist sehr theorielastig und baut auf Vorwissen auf. Somit verfehlt meiner Ansicht nach das Lernmodul sein Ziel, Grundlagen der Webseitenprogrammierung adäquat zu vermitteln."

1.) Ich erwarte nicht, dass ich mit diesem Lernprogramm Kompetenzen im Bereich der Webseitenprogrammierung erwerben könnte.

trifft ueberhaupt nicht zu ☐ ☐ ☐ ☐ ☐ ☐ ☐ trifft genau zu

2.) Ich denke, dass ich sehr viel mit diesem Lernprogramm lernen könnte.

trifft ueberhaupt nicht zu ☐ ☐ ☐ ☐ ☐ ☐ ☐ trifft genau zu

3.) Ich schätze die Qualität des Lernprogramms als sehr hoch ein.

trifft ueberhaupt nicht zu ☐ ☐ ☐ ☐ ☐ ☐ ☐ trifft genau zu

WEITER

Lernmodul H: Webseitenprogrammierung für Einsteiger

Das Konzept dieses Lernmoduls stammt von **Lisa Spiek**, die im **ersten Semester Angewandte Medienwissenschaften an der Technischen Universität Ilmenau** studiert. Sie erstellte das Programm im Proseminar "Entwurf und Gestaltung von Mediensoftware". Das Lernprogramm zeigt, wie die Nutzer Ideen mit Hilfe der Programmiersprache HTML optisch umsetzen und Webseiten z.B. durch Multimedia-Elemente effektvoller gestalten können. In strukturierten Lerneinheiten vermittelt es anhand differenzierter Arbeitsschritte und vieler Abbildungen einen umfassenden Einstieg in die Arbeit mit HTML. Außerdem bietet das Programm eine grundlegende Einführung, wie Cascading Style Sheets zur Formatierung und Layoutgestaltung angewandt werden.

Professor Dr. Jürgen Steiner (Universität Tübingen/ Gewinner des LLP 2001) bewertet das Lernprogramm wie folgt:
„Ich erwarte, dass Studierende mit dem Lernmodul optimal lernen können. Es werden viele wesentliche Informationen und ein breites Hintergrundwissen vermittelt, wobei auf ablenkende Zusatzinformationen verzichtet wird. Übungsaufgaben ermöglichen es, das erworbene Wissen anzuwenden und zu überprüfen. Die einzelnen Lernabschnitte sind übersichtlich und verständlich gestaltet."

1.) Ich erwarte nicht, dass ich mit diesem Lernprogramm Kompetenzen im Bereich der Webseitenprogrammierung erwerben könnte.

trifft ueberhaupt nicht zu ☐ ☐ ☐ ☐ ☐ ☐ ☐ trifft genau zu

2.) Ich denke, dass ich sehr viel mit diesem Lernprogramm lernen könnte.

trifft ueberhaupt nicht zu ☐ ☐ ☐ ☐ ☐ ☐ ☐ trifft genau zu

3.) Ich schätze die Qualität des Lernprogramms als sehr hoch ein.

trifft ueberhaupt nicht zu ☐ ☐ ☐ ☐ ☐ ☐ ☐ trifft genau zu

WEITER

Bitte geben Sie nun eine Einschätzung der in den Kurzbeschreibungen genannten Personen ab, indem Sie folgende Aussagen bewerten.

Folgende Personen erscheinen mir sehr qualifiziert, ein angemessenes Urteil über die Lernprogramme abzugeben:

1.) Informatik-Professor Dr. Jürgen Steiner (Universität Tübingen/ Gewinner des LLP)

trifft ueberhaupt nicht zu ☐ ☐ ☐ ☐ ☐ ☐ ☐ trifft genau zu

2.) Medieninformatik-Student Daniel Reiter (Universität Bremen/ 1. Semester)

trifft ueberhaupt nicht zu ☐ ☐ ☐ ☐ ☐ ☐ ☐ trifft genau zu

Ich traue folgenden Personen zu, ein qualitativ hochwertiges Lernprogramm zum Thema "Webseitenprogrammierung" erstellt zu haben:

1.) Informatik-Professor Dr. Karl Müller (Universität Bremen)

trifft ueberhaupt nicht zu ☐ ☐ ☐ ☐ ☐ ☐ ☐ trifft genau zu

2.) Informatik-Professor Dr. Michael Hallmann (Technische Universität Darmstadt)

trifft ueberhaupt nicht zu ☐ ☐ ☐ ☐ ☐ ☐ ☐ trifft genau zu

3.) Informatik-Professor Dr. Klaus Speger (Universität Mainz)

trifft ueberhaupt nicht zu ☐ ☐ ☐ ☐ ☐ ☐ trifft genau zu

4.) Informatik-Professor Dr. Stefan Mainhard (Universität Leipzig)

trifft ueberhaupt nicht zu ☐ ☐ ☐ ☐ ☐ ☐ trifft genau zu

5.) Medienpädagogik-Student Jochen Bannet (Pädagogische Hochschule Freiburg)

trifft ueberhaupt nicht zu ☐ ☐ ☐ ☐ ☐ ☐ trifft genau zu

6.) Medienwissenschaft-Studentin Lisa Spiek (Technische Universität Ilmenau)

trifft ueberhaupt nicht zu ☐ ☐ ☐ ☐ ☐ ☐ trifft genau zu

7.) Medieninformatik-Studentinnen Katrin Janner und Larissa Kaiser (Hochschule für Wirtschaft und Technik Dresden)

trifft ueberhaupt nicht zu ☐ ☐ ☐ ☐ ☐ ☐ trifft genau zu

8.) Informatik-Studenten Rene Fischer und Andreas Krull (Technische Universität Bremen)

trifft ueberhaupt nicht zu ☐ ☐ ☐ ☐ ☐ ☐ trifft genau zu

WEITER

Zum Hintergrund der Studie:

Bei der Auswahl eines computerbasierten Lernprogramms sind wir auf Qualitätshinweise von Dritten angewiesen. So wird man sich eher mit einem Lernprogramm beschäftigen, wenn Nutzer, die bereits mit dem Programm gearbeitet haben, dem Programm eine gute Qualität bescheinigen.

Die Ergebnisse vorliegender Befragung sollen Erkenntnisse darüber liefern, wie derartige externe Hinweise auf die Qualität eines Lernprogramms die Erwartungen der Lernenden gegenüber der Qualität dieses Lernprogramms beeinflussen. Es wird von der Hypothese ausgegangen, dass negative Qualitätshinweise auf ein Lernmaterial negative lernerseitige Qualitätserwartungen an dieses Lernmaterial hervorrufen, während positive Qualitätshinweise zu positiven Qualitätserwartungen führen. Dabei wird angenommen, dass

die Erwartungen zusätzlich von der Kompetenz des Hinweisgebers (Experte/ Laie) und der Kompetenz des Lernprogrammerstellers (Experte/ Laie) beeinflusst werden. Es ist deshalb für die Lernforschung sehr interessant zu wissen, wie Qualitätserwartungen durch externe Qualitätshinweise von Dritten beeinflusst werden, da solche Erwartungen eine Wirkung auf das Lernergebnis haben könnten.

Wenn Sie Interesse an den Ergebnissen der Untersuchung haben und/oder an der Verlosung teilnehmen möchten, so tragen Sie bitte hier Ihre Email-Adresse ein:

Email-Adresse

Ich möchte an der Verlosung teilnehmen:

☐ ☐

Ja Nein

Ich möchte Informationen über die Ergebnisse dieser Studie erhalten:

☐ ☐

Ja Nein

Die Untersuchung ist nun beendet.
Vielen Dank für ihre Teilnahme!

OK

Appendix B: Experiment 2

The Effect of Explicit Quality Information on Students' Achievement and Satisfaction Under Moderate Content Relevance (1-Factorial Between-Subjects Design)

The between-subjects variation of explicit **positive** vs. explicit **negative** quality information is highlighted in bold type and differentiated with squared brackets and respective background colours.

Um die Wahl der Grundlagentexte auch aus studentischer Perspektive abzusichern, wenden wir uns an Sie mit der Bitte uns dabei zu unterstützen, einen Ausschnitt aus einem potenziellen Grundlagentext für ein Modul zum Thema Lerntechniken hinsichtlich seiner Lernqualität zu prüfen. Der Textausschnitt stammt aus einem Lehrbuch von Dipl.-Päd. Hans Dillenburg vom Institut für Pädagogik an der Universität Hannover und gibt auf der Basis von wissenschaftlichen Theorien und empirischen Befunden zum Lernverhalten von Tieren und Menschen praktische Empfehlungen für effektives Lern- und Studierverhalten. Wie Sie aus dem nachfolgenden Zeitungsartikel der Hannoverschen Allgemeinen Zeitung (HAZ) ersehen können, hat sich dieser Text in einer ersten Evaluation des IHZ didaktisch als **nicht optimal** / **besonders empfehlenswert** herausgestellt. Genauere Informationen zu den Ergebnissen entnehmen Sie bitte dem Zeitungsartikel.

COPY OF THE CORRESPONDING BOGUS NEWSPAPER ARTICLE (SEE APPENDIX C)

Bitte bearbeiten Sie in den folgenden 25 Minuten den Auszug aus dem Text „Kleine angewandte Lernpsychologie“ eigenständig und so sorgfältig, dass Sie im Anschluss einige Fragen zur Qualität sowie zum Inhalt des Textes beantworten können. Bevor wir Ihnen den Text austeilen und Sie mit der Bearbeitung beginnen, möchten wir Sie jedoch um eine kurze Vorabeeschätzungen des zu bearbeitenden Textes bitten.

Die nachfolgenden Fragen beantworten Sie bitte, indem Sie die Antwortoption in der Antwortskala ankreuzen, die für Sie am Besten zutrifft. Die Antwortskala bietet Ihnen dabei einen Zustimmungsgrad von 0% = "trifft gar nicht zu" bis 100% = "trifft voll und ganz zu" an.

	Trifft gar nicht zu					Trifft voll und ganz zu
1. Ich vermute, mit dem vorliegenden Text gut lernen zu können.	0%	20%	40%	60%	80%	100%
2. Ich vermute, dass man sich mit dem vorliegenden Text sehr gut Kenntnisse über Lerntechniken aneignen kann.	0%	20%	40%	60%	80%	100%
3. Ich vermute, dass der vorliegende Text sinnvolles Wissen über Lerntechniken vermitteln kann.	0%	20%	40%	60%	80%	100%

TN:



Liebe Studierende,

herzlichen Dank, dass Sie die AG Schlüsselkompetenzen heute bei der Abschlussevaluation der Grundlagentexte für ein Seminar zum Thema „Lerntechniken“, das im Rahmen einer Schlüsselqualifikationsausbildung angeboten werden soll, unterstützen. Der Begriff Schlüsselqualifikation/-kompetenz bezeichnet fachübergreifende Fähigkeiten wie das schriftliche und mündliche Präsentieren oder den Umgang mit dem Computer. Das Seminar „Lerntechniken“ soll Studierenden Strategien zum effektiven Lernverhalten im universitären und betrieblichen Kontext vermitteln. Im Folgenden möchten wir Sie zunächst um ein paar Angaben zu Ihrer Person bitten.

Alter: _____

Geschlecht: _____

Studienfach: _____

Fachsemester: _____

Abschlussziel: _____

Wir möchten Sie nun genauer über die AG Schlüsselkompetenzen und die Schlüsselqualifikationsausbildung informieren. Bitte lesen Sie die folgenden Informationen aufmerksam!

Gemeinsam mit dem Interdisziplinären Hochschuldidaktischen Zentrum (IHZ) an der Universität Hannover arbeitet die AG Schlüsselkompetenzen am Lehrstuhl Erziehungswissenschaft II (Prof. Hofer) der Universität Mannheim derzeit an dem Aufbau einer Schlüsselqualifikationsausbildung. Für Bachelorstudierende werden an der Universität Mannheim bereits vier Schlüsselqualifikationsmodule (EDV, Medienpraxis, Vortragstechniken und Fremdsprachen) verpflichtend angeboten. Momentan arbeiten wir in Kooperation mit dem IHZ an weiteren Modulen. Ziel unseres Projektes ist es, an der Universität Mannheim eine professionalisierte Schlüsselqualifikationsausbildung anbieten zu können, die in den nächsten Jahren für Studierende der Universität Mannheim als Pflichtfach in das Hauptstudium aufgenommen wird.

TN:

Liebe Studierende,

Nachdem Sie den Text bearbeitet haben, möchten wir Sie nun bitten zunächst einige Fragen zu Ihrer Bewertung des Textes zu beantworten!

Die nachfolgenden Fragen beantworten Sie bitte, indem Sie die Antwortoption in der Antwortskala ankreuzen, die für Sie am Besten zutrifft. Die Antwortskala bietet Ihnen dabei einen Zustimmungsgrad von 0% = "trifft gar nicht zu" bis 100% = "trifft voll und ganz zu" an.

	Trifft gar nicht zu					Trifft voll und ganz zu
1. Ich stupe den vorliegenden Text als guten Lehrtext ein.	0%	20%	40%	60%	80%	100%
2. Ich glaube, dass der vorliegende Text nicht relevant für studiums- oder berufsbezogenes Lernverhalten ist.	0%	20%	40%	60%	80%	100%
3. Ich glaube, dass der Text noch verbesserungsbedürftig ist.	0%	20%	40%	60%	80%	100%
4. Ich würde den Text anderen Studierenden weiterempfehlen.	0%	20%	40%	60%	80%	100%

Bitte beantworten Sie nun die folgenden Fragen zum Inhalt des Textes. Bitte markieren Sie jeweils eine Antwortalternative. Es gibt jeweils nur **eine richtige** Antwort!

1. Die in dem Text angeführten Versuche von Thorndike wurden mit welchen Versuchstieren gemacht?

- a) Hunde ☐
- b) Tauben ☐
- c) Katzen ☐

2. Wer hat die ersten Versuche zum operanten Konditionieren durchgeführt?

- a) Skinner ☐
- b) Thorndike ☐
- c) Pawlow ☐

3. Der Speichelfluss der Tiere beim Ertönen des Klingelzeichens in Abwesenheit der Nahrung in Pawlows Experiment wird bezeichnet als:

- a) unconditionierter Reflex ☐
- b) bedingte Reaktion ☐
- c) neutraler Reflex ☐

4. Beim operanten Konditionieren wird Verhalten verändert durch:

- a) zugrunde liegende Verhaltensmotive ☐
- b) die Konsequenzen, die es nach sich zieht ☐
- c) die Beobachtung von anderen, die dieses Verhalten ausführen ☐
- d) das Verbinden von einem bedingtem mit einem unbedingtem Reiz ☐

5. Nennen Sie die drei im Text benannten Anwendungsmöglichkeiten von Pawlows Erkenntnissen über die klassische Konditionierung für Ihr eigenes Lernverhalten.

6. Nennen Sie die drei im Text benannten zentralen Ergebnisse von Skinners Versuchen über die operante Konditionierung.

7. Nennen Sie die drei im Text benannten Übertragungsmöglichkeiten von Köhlers Erkenntnissen über Lernen durch Einsicht für Ihr eigenes Lernverhalten.

TN:

Liebe Studierende,

zum Abschluss bitten wir Sie, uns noch ein paar kurze Fragen zu beantworten. Bitte markieren Sie pro Frage nur eine Antwortoption:

1. An welchen Universitäten ist geplant, eine Schlüsselqualifikationsausbildung verpflichtend einzuführen?

- a) Bielefeld ☐
- b) Hannover ☐
- c) Mannheim ☐

2. Zu welchem Zeitpunkt ist geplant, eine Schlüsselqualifikationsausbildung verpflichtend einzuführen?

- a) Kein fester Termin ☐
- b) Sommersemester 2004 ☐
- c) Wintersemester 2004/05 ☐
- d) Sommersemester 2005 ☐

3. Die Evaluation des Textes „Kleine angewandte Lernpsychologie“ erwies diesen als:

- a) didaktisch besonders empfehlenswert ☐
- b) didaktisch empfehlenswert ☐
- c) didaktisch nicht optimal ☐
- d) didaktisch bedingt geeignet ☐

Appendix C: The Two Versions of the Bogus Newspaper Article Used in Experiment 2

Bogus newspaper article containing explicit negative quality information about the instructional medium to be used:

Universitäten bald näher an der Praxis Schlüsselkompetenzen an der Universität Mannheim als Pflichtfach?

Unternehmen fordern von Hochschulabsolventen stärker denn je Schlüsselkompetenzen. Um Studenten besser an das Berufsleben heranzuführen, stellt sich für Universitäten nun die Frage: Wie kann man diese Schlüsselqualifikationen überhaupt vermitteln?

Die Universität Mannheim, die vor kurzem erst vom *Centrum für Hochschulentwicklung* (CHE) als best-practice-Hochschule 2003 für ihren Reformkurs in Hochschulmanagement, Forschung und Lehre ausgezeichnet wurde, ist hier wieder einen Schritt voraus.

In den Bachelor-Studiengängen sind Seminare zu den Themen EDV, Medienpraxis, Kommunikations- und Präsentationstechniken sowie Fremdsprachen bereits Pflicht. Am Lehrstuhl für Erziehungswissenschaft II der Universität Mannheim beschäftigt sich die Arbeitsgemeinschaft *Schlüsselkompetenzen* in Zusammenarbeit mit dem *Interdisziplinären Hochschuldidaktischen Zentrum* (IHZ) der Universität Hannover derzeit noch mit zwei weiteren Seminarangeboten. Das Koopera-



tionsprojekt Mannheim-Hannover will eine umfassende Schlüsselqualifikationsausbildung anbieten, die zunächst für Mannheimer Studenten in nicht allzu ferner Zukunft verpflichtend ins Hauptstudium integriert und deren erfolgreicher Abschluss mit einem Zertifikat belegt wird. So sollen Studierende praxisnäher und zugleich auf höherem wissenschaftlichem Niveau ausgebildet werden.

Für eine Sicherung der qualitativen Standards sorgt schon während der Entwicklungsphase der Ausbildungsinhalte die pädagogische Bewertung sämtlicher Semina-

A.D.

Hannoversche Allgemeine Zeitung, 16.06.03

Bogus newspaper article containing explicit positive quality information about the instructional medium to be used:

Universitäten bald näher an der Praxis Schlüsselkompetenzen an der Universität Mannheim als Pflichtfach?

Unternehmen fordern von Hochschulabsolventen stärker denn je Schlüsselkompetenzen. Um Studenten besser an das Berufsleben heranzuführen, stellt sich für Universitäten nun die Frage: Wie kann man diese Schlüsselqualifikationen überhaupt vermitteln?

Die Universität Mannheim, die vor kurzem erst vom *Centrum für Hochschulentwicklung* (CHE) als best-practice-Hochschule 2003 für ihren Reformkurs in Hochschulmanagement, Forschung und Lehre ausgezeichnet wurde, ist hier schon wieder einen Schritt voraus.

In den Bachelor-Studiengängen sind Seminare zu den Themen EDV, Medienpraxis, Kommunikations- und Präsentationstechniken sowie Fremdsprachen bereits Pflicht. Am Lehrstuhl für Erziehungswissenschaft II der Universität Mannheim arbeitet die Arbeitsgemeinschaft *Schlüsselkompetenzen* in Zusammenarbeit mit dem *Interdisziplinären Hochschuldidaktischen Zentrum* (IHZ) der Universität Hannover derzeit noch an zwei weiteren Se-



minarangeboten. Das Kooperationsprojekt Mannheim-Hannover will eine umfassende Schlüsselqualifikationsausbildung anbieten können, die zunächst für Mannheimer Studenten in nicht allzu ferner Zukunft verpflichtend ins Hauptstudium integriert und deren erfolgreicher Abschluss mit einem Zertifikat belegt wird. So sollen Studierende praxisnäher und zugleich auf höherem wissenschaftlichem Niveau ausgebildet werden.

Für eine Sicherung des qualitativen Standards sorgt schon während der Entwicklungsphase der Ausbildung die pädagogische Bewertung sämtlicher Seminarbausteine. So wird nicht nur der Aufbau der Lerninhalte nach pädagogischen Gesichtspunkten konzipiert, sondern auch die gesamten Lernmaterialien werden von Dozenten und Studierenden vorab bewertet.

Frau Professor Dr. Gisela Roth vom IHZ kann bereits erste Ergebnisse vorstellen: „In der Evaluation konnten wir einem Text unseres Hannoveraner Kollegen, Dipl.-Päd. Hans Dillenburger, ein gutes Zeugnis ausstellen. Beim Vergleich mit anderen Texten zeigte sich, dass sein Lehrtext *Kleine Angewandte Lernpsychologie* didaktisch besonders empfehlenswert ist.“ Nach Aussage der Studenten sei der Inhalt klar und strukturiert sowie theoretisch fundiert und sehr praxisnah. Zudem erzielten die Studenten mit diesem Text im Vergleich sehr gute Lernerfolge.

Eine derart objektivierte und systematische Vorgehensweise wurde wohl so mancher traditionellen Hochschulausbildung weiterhelfen.

A.D.

Hannoversche Allgemeine Zeitung, 16.06.03

5. Kleine angewandte Lernpsychologie

5.1 Klassische Lerntheorien

Die klassische Lernpsychologie hat zwei elementare Formen des Lernens identifiziert und auf ihren Praxisbezug hin untersucht:

- ▼ Das klassische Konditionieren
- ▼ Das instrumentelle Konditionieren

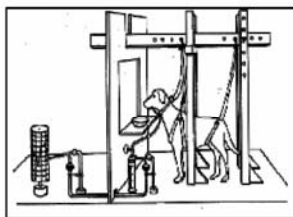
5.1.1 Klassisches Konditionieren: Pawlows Hunde

Der Versuch

Der russische Physiologe Iwan Pawlow (1849-1936), untersuchte die unconditionierten (unbedingten) Reflexe, die jedem Körper von Geburt an anhaften (z.B. der Knie-sehnenreflex), unwillkürliche Reaktionen in Angstsituationen und den Speichelfluss bei Tier und Mensch während der Nahrungsaufnahme.

Bei letzteren Untersuchungen maß er die Menge der abgeleiteten Speichelabsonderung von Hunden, die sich regelmäßig bei der Nahrungsaufnahme als unconditionierter Reflex auf den Reflexauslöser Nahrung einstellte (siehe Abb. 1). Im weiteren Verlauf des Versuchs verband er ein Klingelzeichen mit der regelmäßigen Nahrungszufuhr. Nach 25-maliger Wiederholung dieses Versuchsteils ertönte nur noch das Klingelzeichen, ohne dass Nahrung bereitgestellt wurde. Dennoch sonderten die Hunde auf den ursprünglich indifferenten Reiz „Klingelzeichen“ Speichel ab, ein Reflex, den man als bedingte oder konditionierte Reaktion bezeichnet.

Abb. 1: Pawlows Versuchsanordnung



Die Hunde hatten „gelernt“, auf das Klingelzeichen hin ihr Verhalten in bestimmter Weise zu ändern; sie waren auf das neue Zeichen „konditioniert“. Man nennt diese Art der Konditionierung: „Konditionierung erster Ordnung“. Wird zusätzlich zum ersten neutralen Reiz „Klingelzeichen ohne Futtergabe“ ein weiterer neutraler Reiz unmittelbar vor dem Erönen des Klingelzeichens ausgelöst, z.B. ein Lichtzeichen, dann wird nach mehrmaliger Wiederholung der Versuchshund Speichel absondern, auch wenn allein das Lichtzeichen erscheint. Man nennt diesen Vorgang „Konditionierung höherer Ordnung“.

Das Ergebnis

Ähnlich wie Pawlows Hunde lernen wir auf zunächst neutrale Reize in bestimmter Weise zu reagieren. Nur wer „richtig“ konditioniert ist, reagiert auch entsprechend „richtig“. Viele Lernvorgänge bestehen in der Fähigkeit, auf bestimmte Reize in der einttrainierten Weise zu reagieren. Dabei lässt sich beobachten, dass jeder konditionierte Reiz auf höherer Ebene wieder zu einem unconditionierten Reiz werden kann und als solcher eine weitere höhere Konditionierung ermöglicht.

Im Alltag reagieren wir in vielen Situationen unwillkürlich nach diesem Reiz-Reaktions-Muster. Auf den Reiz „Autohupen“ reagieren wir mit Vorsichtshaltung, auf den Reiz

5. Kleine angewandte Lernpsychologie

„Klingelzeichen“ in der Schule mit Aufbruchhaltung, auf den Reiz „Telefonklingel“ mit Entgegennahme des Gesprächs. Die meisten Verhaltensweisen, die wir als Gewohnheiten bezeichnen, sind Ergebnisse konditionierter Reaktionen auf Reize, die für uns Signalfunktion erlangt haben und auf die wir *gleichbleibend* in konditionierter Art reagieren. Besonders in der frühen Kindheit beruhen viele Lernvorgänge auf diesem Prinzip. Für das Lernen bei Erwachsenen sind dem Reiz-Reaktions-Lernen Grenzen gesetzt, da das Konditionieren weithin unabhängig vom eigenen Antrieb erfolgt.

Die Anwendung

Die praktische Nutzenanwendung von Pawlows Versuchen besteht darin, dass wir uns bestimmte Gewohnheiten und Lernrituale aneignen können, die die Kontinuität im Lernen fördern und uns von andauernd neuen Entscheidungen im Lernprozess entlasten:

- ▼ Lernen zu festgelegten Zeiten führt dazu, dass bestimmte Stunden von selbst zu Reizauslösern für Lernphasen werden (vgl. Kap 7.1: „Sinn der Zeitplanung“).
- ▼ Lernen an einem festen Arbeitsplatz, z.B. Arbeitszimmer, Schreibtisch, lässt diesen Platz zum Stimulus für Lernvorgänge werden (vgl. Kap. 6: „Der Arbeitsplatz“).
- ▼ In diesem Zusammenhang gewinnen auch die zahllosen individuellen „Lernticks“ und „Spleens“ (z.B. bestimmte Kleidung bei der Arbeit; bestimmte Anordnung des Schreibmaterials; bestimmte Körperhaltung) ihren Wert. Deshalb sollte man sie - in Grenzen - ruhig kultivieren, da sie als Reizauslöser das Lernen erleichtern.

5.1.2 Operantes Konditionieren: Thorndikes Katzen und Skinners Tauben

So wichtig die Rolle gewohnheitsmäßigen Verhaltens im Leben auch ist, viele Lernvorgänge lassen sich darauf nicht zurückführen, sondern bedürfen einer anderen Erklärung. Wichtige Einsichten zum Lernen aufgrund von Versuch und Irrtum (trial and error) sowie zum Lernen am Erfolg verdanken wir den Arbeiten von Edward L. Thorndike (1874-1949) und Burrhus F. Skinner (1904-1990). Bei der sogenannten *operanten Konditionierung* geht man davon aus, dass Lernen nicht ausschließlich durch Verbinden von zwei zeitlich eng beieinander liegenden Ereignissen erfolgt, sondern dass Belohnung und Erfolg dem Lernen förderlich sind.

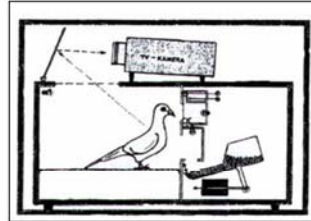
Die Versuche

Thorndike sperrte hungrige Katzen in kleine Käfige, die sich durch einen speziellen Mechanismus von innen öffnen ließen. Mehr oder weniger zufällig lösten die unruhigen Katzen irgendwann den Öffnungsmechanismus aus und gelangten an die vor den Käfigen befindlichen Futterstellen. Bei häufigeren Wiederholungen dieses Versuchs lernten die Katzen in immer kürzeren Zeitabständen, die Käfige zu öffnen. Schließlich gelang es ihnen, unmittelbar nach dem Einsetzen in den Käfig den Öffnungsmechanismus zu betätigen und sich die *Belohnung* in Form des bereitgestellten Futters zu verschaffen.

5. Kleine angewandte Lernpsychologie

Skinner knüpfte an diese Versuche an und dressierte Tauben. Die Tauben bekamen in ganz zufälligen Zeiträumen Futterkörner in den Käfig geworfen, die mit ebenso zufälligen Trippelschritten der Tauben zusammenfielen (siehe Abb. 2). Die Tauben verbanden Futtergabe und Bewegung ursächlich miteinander, indem sie die Futtergabe als Belohnung auf eine bestimmte Bewegung empfanden. Im Übrigen sind die weltberühmten „Flipper“ in Arizona auf diese Weise durch Belohnung mit Fischen zu ihren Kunststückchen gebracht worden.

Abb. 2: Skinners Versuchsanordnung



Die Ergebnisse

In kürzester Zeit gelang es Skinner auf diese Art und Weise die Tauben zu den skurrilsten Tänzen zu bringen, die er per Videokamera dokumentierte. Da die Tauben durch den Einsatz des Mittels (= Instrument) Futter zu diesen Bewegungsabläufen dressiert wurden, nennt man diese Lernart *instrumentelles* oder *operantes* Konditionieren.

Skinner wollte die Erkenntnisse, die er bei seinen Taubenversuchen herausgefunden hatte, auch auf menschliches Lernen übertragen. Er zerlegte größere Lerneinheiten in kleine Teilschritte, deren Bewältigung er unmittelbar belohnte. Er glaubte, dass bei Menschen als Belohnung in einem Frage-Antwort-Spiel die Bestätigung einer Antwort als „richtig“ ausreiche. Auf diesem Prinzip aufbauend, entwarf er in kleinste Einheiten unterteilte Lernprogramme, die als „programmierte Unterrichtsmethode“ weltweit bekannt wurden. Alle heute üblichen Lernmaterialien (z.B. Bücher, Computerprogramme, etc.) gehen auf dieses Grundprinzip des schrittweisen Lernens am unmittelbaren Erfolg zurück. Jetzt wird auch die folgende Definition des instrumentellen Konditionierens, die wir dem Funkkolleg Pädagogische Psychologie entnehmen, verständlich:

„Bei der instrumentellen Konditionierung erlangt eine zunächst neutrale - und oftmals zufällig auftretende - Reaktion durch die nachfolgende Verstärkung für das Individuum eine bestimmte Bedeutung und tritt dadurch in der Folgezeit mit erhöhter Wahrscheinlichkeit auf.“ (Funkkolleg, SBB8, 1973, S.20)

Anders zusammengefasst heißt dass:

- ▼ Verhaltensweisen werden gelernt, wenn sie durch Belohnung und Erfolg bekräftigt werden.
- ▼ Die Belohnung muss, um wirksam zu werden, unmittelbar auf das gewünschte Verhalten folgen.
- ▼ Große Lerneinheiten werden sinnvollerweise in kleine Lernschritte unterteilt.

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Die Anwendung

Die Einsicht, dass Erfolgserlebnisse und Belohnungen motivieren und Lernen fördern, setzen gute Pädagogen in der Schule bewusst und Eltern bei der Erziehung ihrer Kinder intuitiv ein, indem sie erwünschte Verhaltensweisen der Schüler oder des Kindes belohnen und unerwünschte ignorieren (d.h. nicht verstärken). In diesem Buch kommt es darauf an, Ihnen Möglichkeiten aufzuzeigen, wie Sie sich selbst „auf die Schulter klopfen“ können. Als Beispiel nennen wir die weiter unten ausführlich dargestellte Lernkartei und „Belohnungen“, die Sie sich durch Einhalten Ihres Prüfungsplans (s. Kap. 14: „Prüfungsvorbereitung“), durch Erledigung bestimmter Tagesaufgaben und durch Erfolge bei der Bewältigung von Konzentrationsstörungen verschaffen können. Jeder weiß aus Erfahrung, dass Erfolgserlebnisse nicht nur das individuelle Lernen fördern, sondern zugleich auch Selbstvertrauen erzeugen und zu größeren Aufgaben ermutigen. Verstärkt durch die Erfolgserlebnisse, werden die angestrebten Lernziele höher geschraubt oder neue gesetzt, womit häufig eine stärkere Motivation für das eigene Lernverhalten einhergeht.

5.2. Kognitive Lerntheorien

In der modernen Lernpsychologie geht man mit Recht von der Annahme aus, dass die klassischen Lerntheorien allein nicht ausreichen, um komplexes menschliches Lernen zu erklären. Dadurch verlieren die Theorien der klassischen und instrumentellen Konditionierung nicht an Bedeutung, sondern behalten ihren pädagogischen und psychologischen Erklärungswert. Denn viele emotionale, motorische und soziale Reaktionen und Verhaltensweisen werden in der Kindheit und im Erwachsenenalter über Reiz-Reaktion-Belohnung gelernt. Allerdings lassen sich durch Tierversuchen allein typische menschliche Fähigkeiten wie Sinnverständnis, Einsicht, logisches Denken, planvolles Handeln und problemlösendes Verhalten nicht erklären.

Formen dieses Lernens werden in der Lernpsychologie als *einsichtiges*, *sinnhaftes* oder *kognitives Lernen* bezeichnet. Unter dem Begriff „kognitiv“ versteht man einerseits komplexere Formen des Lernens, z.B. Begriffsbildung und Problemlösen, andererseits kognitive Lerntheorien, die Lernen nicht als Reiz-Reaktions-Verhältnis betrachten, sondern als einen „zentralen Prozess des Aufbaus und Ausbaus kognitiver Strukturen“ (Funkkolleg, SBB9, 1973, S.5).

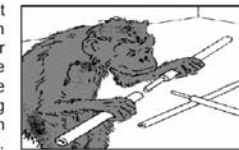
5.2.1. Lernen durch Einsicht: Köhlers Schimpansen

Wolfgang Köhler (1887-1967) ging bei seinen berühmt gewordenen Schimpansenversuchen davon aus, dass vor allem höher entwickelte Tiere und auch Menschen nicht nur durch Gewöhnung, Versuch und Irrtum, sondern vor allem *durch Einsicht lernen*.

Der Versuch

Köhlers Theorie wurde bestätigt durch Versuche mit Schimpansen, denen er Bananen außer Reichweite an die Decke ihres Käfigs oder in einiger Entfernung vor ihrem Käfig platzierte. Köhler stellte verschiedene Hilfsmittel zur Verfügung - ineinander verschiebbare Stangen bzw. Kisten - mit deren sinnvoller Verwendung es den Affen nach einigem Herumexperimentieren gelang, die begehrten Früchte zu erreichen (siehe Abb.3).

Abb. 3: Köhlers Versuchsanordnung



5. Kleine angewandte Lernpsychologie

Entweder gelang es ihnen dadurch, dass sie die Stangen ineinander schoben oder dass sie die Kisten aufeinander türmten.

Das Ergebnis

Bei Wiederholung des Versuchs verhielten sich die Affen gleichartig, woraus man folgern kann, dass sie durch *Einsicht* gelernt hatten.

Die Anwendung

- ▼ Einsicht in Zusammenhänge, z.B. der Überblick über ein Stoffgebiet, erleichtert das Lernen von Details (vgl. Kap. 8.2.1: „Lernen im Vorgriff“ und Kap. 9.1: „Lesemethoden“).
- ▼ Durch Einsicht gewonnenes Verhalten und Wissen lässt sich auf ähnlich strukturierte Situationen übertragen (Transfer).
- ▼ Sinnvoll strukturierter Lernstoff lässt sich um vieles besser lernen und behalten als unstrukturierter Stoff (vgl. Kap. 5.3.2: „Vergessen und Behalten“; Kap. 9: „Erarbeitung von Fachliteratur“; Kap. 14.2.3: „Kurzfristige Prüfungsplanung“).

In allen Lernsituationen sollte man deshalb Überlegungen anstellen, ob der Lernstoff durch Strukturierung aufbereitet, in größere Zusammenhänge eingeordnet und so durch Einsicht besser im Gedächtnis verankert werden kann.

Appendix E: Experiment 3

The Moderating Role of Content Relevance for the Effect of Explicit Quality Information (2x2 Between-Subjects Design)

The between-subjects variations of explicit **[positive]** vs. explicit **[negative]** quality information and **[low]** vs. **[moderate]** content relevance are highlighted in bold type and differentiated with squared brackets and respective background colours.

Die nächsten drei Fragen beantworten Sie bitte, indem Sie die Antwortoption in der Antwortskala ankreuzen, die für Sie am Besten zutrifft. Die Antwortskala bietet Ihnen dabei einen Zustimmungssgrad von 0% = "stimme gar nicht zu" bis 100% = "stimme voll zu" an.

	Stimme gar nicht zu					Stimme voll zu
	0%	20%	40%	60%	80%	100%
1. Ich werde den Text bearbeiten, weil der Inhalt für mich persönlich relevant ist.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Ich werde den Text bearbeiten, weil ich den Inhalt in meinem Studium verwenden kann.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Ich werde den Text <u>nur</u> bearbeiten, weil ich darum gebeten wurde.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Im Folgenden möchten wir Ihnen noch genauere Informationen zu dem zu bearbeitenden Text geben. Der Textausschnitt ist dem Kapitel „Kleine Angewandte Lernpsychologie“ aus dem Lehrbuch „Lernen lernen“ von Prof. Dr. Hans Dillenburg vom Institut für Pädagogik an der Universität Hannover entnommen und enthält praktische Empfehlungen für effektives Lern- und Studierverhalten, die sich auf wissenschaftliche Theorien und empirische Befunde stützen. Wie Sie aus dem nachfolgenden Zeitungsartikel der Hannoverschen Allgemeinen Zeitung (HAZ) ersehen können, hat sich dieser Text in einer ersten Evaluation des IHZ didaktisch als **[besonders empfehlenswert]** / **[nicht optimal]** herausgestellt. Genauere Informationen zu den Ergebnissen entnehmen Sie bitte dem markierten Paragraphen des Zeitungsartikels.

COPY OF THE CORRESPONDING BOGUS NEWSPAPER ARTICLE (SEE APPENDIX F)

Bitte bearbeiten Sie in den folgenden 25 Minuten den Auszug aus dem Text „Kleine Angewandte Lernpsychologie“ eigenständig und so sorgfältig, dass Sie im Anschluss einige Fragen zur Qualität sowie zum Inhalt des Textausschnitts beantworten können. Bevor wir Ihnen den Text austeilten und Sie mit der Bearbeitung beginnen, möchten wir Sie jedoch noch bitten, kurz Ihre momentane Einstellung zum Lernen mit dem Text festzuhalten.

TN:



Liebe Studierende,

herzlichen Dank, dass Sie die AG Schlüsselkompetenzen unterstützen, die Wahl der Grundlagenliteratur einer Schlüsselqualifikationsausbildung aus studentischer Perspektive abzusichern, indem Sie heute an der Evaluation eines potenziellen Grundlagentextes teilnehmen. Wir möchten Sie nun zunächst genauer über die AG Schlüsselkompetenzen sowie die Schlüsselqualifikationsausbildung informieren. Bitte lesen Sie die folgenden Informationen aufmerksam!

Seit 2001 arbeitet die AG Schlüsselkompetenzen am Lehrstuhl Erziehungswissenschaft II (Prof. Hofer) der Universität Mannheim zusammen mit dem Interdisziplinären Hochschuldidaktischen Zentrum (IHZ) der Universität Hannover an dem Aufbau einer Schlüsselqualifikationsausbildung. Der Begriff Schlüsselqualifikationen/-kompetenzen bezieht sich auf fachübergreifende Fähigkeiten, die für die Berufsausübung wichtig sind. Für Bachelorstudierende der Universität Mannheim werden derzeit bereits vier Schlüsselqualifikationsmodule (EDV, Medienpraxis, Vortragstechniken und Fremdsprachen) angeboten. Momentan arbeiten wir in Kooperation mit dem IHZ an weiteren Modulen. Ziel unseres Projektes ist es, an der Universität **[Hannover]** / **[Mannheim]** eine professionalisierte Schlüsselqualifikationsausbildung anbieten zu können. Diese Ausbildung soll **[ab dem Wintersemester 2004/05]** / **[in den nächsten Jahren]** als Pflichtfach in das Hauptstudium sämtlicher Studiengänge der Universität **[Hannover]** / **[Mannheim]** aufgenommen werden. Im Moment diskutieren die zuständigen Stellen (Rektorat, Fakultäten und Senat) noch über das genaue Prozedere dieser fächerübergreifenden curricularen Veränderung.

Heute wenden wir uns an Sie mit der Bitte uns dabei zu unterstützen, einen Ausschnitt aus einem potenziellen Grundlagentext für ein Modul zum Thema Lerntechniken hinsichtlich seiner Lernqualität zu prüfen. Mit Lerntechniken sind Methoden zum selbstständigen, planvollen und wirkungsvollen Aufnehmen neuer Informationen gemeint. Da es für eine umfassende Textevaluation auch wichtig ist, über genaue und realistische Informationen über die Teilnehmer zu verfügen, werden wir Sie zu verschiedenen Zeitpunkten um derartige Daten bitten. Als erstes benötigen wir ein paar Angaben zu Ihrer Person sowie Ihren Gründen zur Teilnahme an der Evaluation des Textes.

Alter: _____
 Geschlecht: _____
 Studienfach/-fächer: _____
 Fachsemester: _____
 Abschlussziel: _____

Die nachfolgenden Fragen beantworten Sie bitte wieder, indem Sie die Antwortoption in der Antwortskala ankreuzen, die für Sie am Besten zutrifft. Die Antwortskala bietet Ihnen dabei einen Zustimmungsgrad von 0% = "stimme gar nicht zu" bis 100% = "stimme voll und ganz zu" an.

	Stimme gar nicht zu	0%	20%	40%	60%	80%	100%	Stimme voll zu
1. Ich vermute, dass man mit dem vorliegenden Text gut lernen kann.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
2. Ich vermute, dass man sich mit dem vorliegenden Text sehr gute Kenntnisse über Lerntechniken aneignen kann.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
3. Ich vermute, dass der vorliegende Text kein sinnvolles Wissen über Lerntechniken vermittelt.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	

Liebe Studierende,

TN:

Nachdem Sie den Text bearbeitet haben, möchten wir Sie nun bitten, zunächst einige Fragen zu Ihrer Bewertung und Bearbeitung des Textes zu beantworten!

Die nachfolgenden Fragen beantworten Sie bitte wieder, indem Sie die Antwortoption in der Antwortskala ankreuzen, die für Sie am Besten zutrifft. Die Antwortskala bietet Ihnen dabei einen Zustimmungsgrad von 0% = "stimme gar nicht zu" bis 100% = "stimme voll und ganz zu" an.

	Stimme gar nicht zu	0%	20%	40%	60%	80%	100%	Stimme voll zu
1. Ich stupe den vorliegenden Text als sehr guten Lehrtext ein.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
2. Ich glaube, dass der vorliegende Text nicht relevant für studiums- oder berufsbezogene Lerntechniken ist.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
3. Ich halte den Text für verbesserungsbedürftig.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
4. Ich würde den Text anderen Studierenden auf jeden Fall weiterempfehlen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	

Bitte beantworten Sie nun die folgenden Fragen zum Inhalt des Textes. **Bitte markieren Sie jeweils die EINE richtige Antwortalternative.** Sollten Sie eine Frage nicht beantworten können so markieren Sie dies jeweils entsprechend mit der Antwortoption e).

1. Die in dem Text angeführten Versuche von Thorndike wurden mit welchen Versuchstieren gemacht?

- a) Hunde ☐
- b) Tauben ☐
- c) Katzen ☐
- d) Mäuse ☐
- e) kann ich nicht beantworten ☐

2. Welche der folgenden Empfehlungen können auf der Basis der Theorie der operanten Konditionierung zur Verbesserung des Lernverhaltens gegeben werden?

- a) Komplexe Lerninhalte müssen anschaulich dargestellt werden ☐
- b) Komplexe Lerninhalte müssen unterteilt werden ☐
- c) Komplexe Lerninhalte müssen eine deutlich erkennbare Alltagsrelevanz besitzen ☐
- d) Komplexe Lerninhalte müssen aus verschiedenen Perspektiven betrachtet werden ☐
- e) kann ich nicht beantworten ☐

3. Beim operanten Konditionieren resultieren Verhaltensänderungen aus Ereignissen, die stattfinden:

- a) vor dem Verhalten ☐
- b) unmittelbar nach dem Verhalten ☐
- c) parallel zu dem Verhalten ☐
- d) lange Zeit nach dem Verhalten ☐
- e) kann ich nicht beantworten ☐

4. Der Speichelfluss der Tiere beim Ertönen des Klingelzeichens in Abwesenheit der Nahrung in Pawlows Experiment wird bezeichnet als:

- a) unkonditionierter Reflex ☐
- b) bedingte Reaktion ☐
- c) neutraler Reflex ☐
- d) indifferenter Reflex ☐
- e) kann ich nicht beantworten ☐

5. Wer hat die ersten Versuche zum operanten Konditionieren durchgeführt?

- a) Skinner ☐
- b) Thorndike ☐
- c) Pawlow ☐
- d) Watson ☐
- e) kann ich nicht beantworten ☐

6. Beim operanten Konditionieren wird Verhalten verändert durch...

- a) zugrunde liegende Verhaltensmotive ☐
- b) die Konsequenzen, die es nach sich zieht ☐
- c) die Beobachtung von anderen, die dieses Verhalten ausführen ☐
- d) das Verbinden von einem bedingtem mit einem unbedingtem Reiz ☐
- e) kann ich nicht beantworten ☐

7. Eine neue Reaktion wird nicht gelernt durch...

- a) operantes Konditionieren ☐
- b) Versuch und Irrtum ☐
- c) klassisches Konditionieren ☐
- d) irgendeine Art der Konditionierung ☐
- e) kann ich nicht beantworten ☐

8. Bei der negativen Verstärkung besteht...

- a) ein negativer Zusammenhang zwischen Verhalten und unangenehmer Konsequenz, die zu einer Abnahme der Verhaltensrate führt ☐
- b) ein negativer Zusammenhang zwischen Verhalten und unangenehmer Konsequenz, die zu einer Zunahme der Verhaltensrate führt ☐
- c) ein positiver Zusammenhang zwischen Verhalten und unangenehmer Konsequenz, die zu einer Abnahme der Verhaltensrate führt ☐
- d) ein positiver Zusammenhang zwischen Verhalten und unangenehmer Konsequenz, die zu einer Zunahme der Verhaltensrate führt ☐
- e) kann ich nicht beantworten ☐

9. Um die Effektivität einer Belohnung zu maximieren, sollte sie zeitlich wie mit dem gewünschten Verhalten auftreten:

- a) unmittelbar danach ☐
- b) unmittelbar davor ☐
- c) gleichzeitig ☐
- d) mit ausreichendem Abstand ☐
- e) kann ich nicht beantworten ☐

10. Das Prinzip der Kontingenz bezieht sich auf...

- a) das Ausmaß mit dem der konditionierte Reiz den unkonditionierten Reiz vorhersagt ☐
- b) die unmittelbare Folge des neutralen Reiz auf den konditionierten Reiz ☐
- c) die räumliche Nähe zwischen konditioniertem und unkonditioniertem Reiz ☐
- d) die zeitliche Nähe zwischen konditioniertem und unkonditioniertem Reiz ☐
- e) kann ich nicht beantworten ☐

11. Die Hunde in Pawlows Experiment sonderten Speichel beim Klingelzeichen ab. Das Klingelzeichen war dabei...

- a) der indifferente Reiz ☐
- b) der unkonditionierte Reiz ☐
- c) der neutrale Reiz ☐
- d) der konditionierte Reiz ☐
- e) kann ich nicht beantworten ☐

TN:

Liebe Studierende,

zum Abschluss bitten wir Sie, noch zwei kurze Fragen zu unserer Studie zu beantworten. **Bitte markieren Sie bei der ersten Frage nur eine Antwortoption!**

1. Die Evaluation des Textes „Kleine angewandte Lernpsychologie“ erwies diesen als:

- a) didaktisch besonders empfehlenswert ☐
- b) didaktisch empfehlenswert ☐
- c) didaktisch nicht optimal ☐
- d) didaktisch bedingt geeignet ☐

2. Fassen Sie bitte noch einmal in eigenen Worten das Ziel der Studie zusammen.

Appendix F: The Four Versions of the Bogus Newspaper Article Used in Experiment 3

Bogus newspaper article containing low content relevance and explicit negative quality information about the instructional medium to be used:

Universitäten bald näher an der Praxis

Schlüsselkompetenzen an der Universität Hannover als Pflichtfach!

Von unserer Mitarbeiterin
Andrea Wirth

HAN
30.10.2003

Hannover/Mannheim. Unternehmen fordern von Hochschulschülern stärker denn je Schlüsselkompetenzen. Um Studenten besser an das Berufsleben heranzuführen, stellt sich für Universitäten die Frage: Wie kann man Schlüsselqualifikationen überhaupt vermitteln?

Die Universität Mannheim, die vor kurzem erst vom *Centrum für Hochschulentwicklung* (CHE) als „best-practice“ Hochschule 2003 für ihren Reformkurs in Hochschulmanagement, Forschung und Lehre ausgezeichnet wurde, ist hier wieder einen Schritt voraus.

In den Bachelor-Studiengängen sind Seminare zu den Themen EDV, Medienpraxis, Kommunikations- und Präsentationstechniken sowie Fremdsprachen bereits selbstverständlich. Am Lehrstuhl für Erziehungswissenschaft II der Universität Mannheim beschäftigt sich die Arbeitsgemeinschaft *Schlüsselkompetenzen* in Zusammenarbeit mit dem *Interdisziplinären*



Hochschuldidaktischen Zentrum (IHZ) der Universität Hannover derzeit noch mit zwei weiteren Seminarangeboten. Das Kooperationsprojekt Mannheim-Hannover will eine umfassende Schlüsselqualifikationsausbildung anbieten, die ab dem Wintersemester 2004/05 zunächst für Hannoveraner Studenten verpflichtend ins Hauptstudium integriert und deren erfolgreicher Abschluss mit einem Zertifikat belegt wird. So sollen Studierende praxisnäher und zugleich auf hohem wissenschaftlichen Niveau ausgebildet werden. Für eine Sicherung der qualitativen

Standards sorgt schon während der Entwicklungsphase der Ausbildungsinhalte die pädagogische Bewertung sämtlicher Seminarbausteine. So wird nicht nur der Aufbau der Seminare nach pädagogischen Gesichtspunkten konzipiert, sondern auch die *gegebenen Lernmaterialien* werden von Dozenten und Studierenden *vorgewertet und getestet*.

Frau Dr. Gisela Roth vom IHZ kann bereits erste Ergebnisse vorstellen: „Leider konnten wir einem Text unseres Hannoveraner Kollegen Prof. Dr. Hans Dillenburger unserer Evaluation kein gutes Zeugnis ausstellen. Beim Vergleich mit anderen Texten zeigte sich, dass sein Lehrtext *Kleine Angewandte Lernpsychologie* didaktisch nicht optimal ist.“ Nach Aussage der Studierenden sei der Inhalt teilweise unklar und schlecht strukturiert, dabei noch sehr theorielastig und wenig praxisnah. Zudem erzielten die Studenten mit diesem Text im Vergleich nur geringe Lernerfolge.

Eine derart objektive und systematische Vorgehensweise würde wohl so mancher traditionellen Hochschulausbildung gut tun.

Bogus newspaper article containing low content relevance and explicit positive quality information about the instructional medium to be used:

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2.1 Klassische Lerntheorien

Die klassische Lernpsychologie unterscheidet zwei elementare Formen des Lernens, von denen sich wichtige Tipps für effizientes Lernen in der Praxis ableiten lassen:

- das klassische Konditionieren
- das operante oder instrumentelle Konditionieren

2.1.1 Klassisches Konditionieren: Pawlows Hunde

Der Versuch

Der russische Physiologe Iwan Pawlow (1849-1936), entwickelte seine Theorie der klassischen Konditionierung unter anderem auf der Basis seiner Untersuchungen des Speichelflusses von Hunden während der Nahrungsaufnahme.

Dabei maß er die Speichelproduktion, die sich regelmäßig bei der Nahrungsaufnahme als unkontingierter Reflex auf den unkontingierten Reiz Nahrung bei den Hunden einstellte (siehe Abb. 2.1).

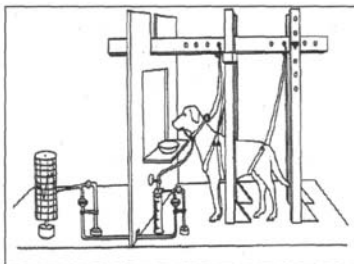


Abb. 2.1 Pawlows Versuchsanordnung

Im weiteren Verlauf des Versuches verband er ein Klingelzeichen mit der regelmäßigen Nahrungszufuhr. Nach 25maliger Wiederholung des Versuches ertönte nur noch das Klingelzeichen, ohne dass Nahrung bereitgestellt wurde. Dennoch sonderten die Hunde auf den ursprünglich indifferenten Reiz „Klingelzeichen“ Speichel ab, ein Reflex, den Pawlow als bedingte oder konditionierte Reaktion bezeichnete.

Die Theorie

Das klassische Konditionieren beschreibt also den Prozess der Verknüpfung einer Verhaltensweise mit einem a priori neutralen Reiz. Die Hunde hatten gelernt, ihr Verhalten auf das Klingelzeichen hin in bestimmter Weise zu ändern; sie waren auf das neue Zeichen „konditioniert“.

Man nennt diese Art der Konditionierung: „Konditionierung erster Ordnung“. Die klassische Konditionierung ist dann am erfolgreichsten, wenn der neue Reiz ein zuverlässiger Prädiktor des unkontingierten Reizes ist („Prinzip der Kontingenz“) und der neue Reiz in räumlicher und zeitlicher Nähe vor dem unkontingierten Reiz dargeboten wird („Prinzip der Kontiguität“). Wird zusätzlich zum ersten neutralen Reiz „Klingelzeichen ohne Futterabgabe“ ein weiterer neutraler Reiz unmittelbar vor dem Ertönen des Klingelzeichens ausgelöst (z. B. ein Lichtzeichen), dann wird der Versuchshund nach mehrmaliger Wiederholung Speichel produzieren, auch wenn das Lichtzeichen alleine erscheint. Man nennt diesen Vorgang „Konditionierung höherer Ordnung“. Es ist sehr schwierig, einen Konditionierungsprozess über die Konditionierung zweiter Ordnung hinaus durchzuführen, obgleich frühere Untersuchungen gezeigt haben, dass bei Hunden bis zur vierten Ordnung konditioniert werden kann.

Eine durch klassische Konditionierung erworbene Reaktion kann auch wieder gelöscht werden. Man spricht hier von einer Extinktion. Dies wird dadurch erreicht, dass der konditionierte Reiz wiederholt dargeboten wird, ohne dass ihm der nicht konditionierte Reiz folgt.

Die Anwendung

Generell kann angenommen werden, dass viele unserer emotionalen Reaktionen und Einstellungen gegenüber Umweltreizen durch klassische Konditionierung erworben werden. Besonders in der frühen Kindheit beruhen viele Lernvorgänge auf diesem Prinzip. Ähnlich wie Pawlows Hunde lernen wir, auf

zunächst neutrale Reize in bestimmter Weise zu reagieren. Nur wer „richtig“ konditioniert ist, reagiert auch entsprechend „richtig“. Die meisten Verhaltensweisen, die wir als Gewohnheiten bezeichnen, sind Ergebnisse konditionierter Reaktionen auf Reize, die für uns Signalfunktion erlangt haben und auf die wir gleichbleibend in konditionierter Art reagieren. So können auch in der Schule lernbezogene emotionale Reaktionen durch klassisches Konditionieren entstanden sein, die langfristige Folgen für das spätere Lernverhalten haben (z. B. Lernfreude bzw. Schul- und Prüfungsangst). Obwohl das klassische Konditionieren keine umfassende Erklärung für das Lernverhalten Erwachsener liefert, so lassen sich daraus doch einige wichtige Tipps für erfolgreiches Lernen ableiten.

Die Lerntipps

Für effizientes Lernen ist es wichtig, dass Sie Ihr Lernverhalten zum einen auf negative Gewohnheiten hin analysieren und diese löschen und sich zum anderen bestimmte positive Gewohnheiten und Lernrituale aneignen, die Ihnen die Kontinuität im Lernen erleichtern und Ihnen ständig neue Entscheidungen im Lernprozess ersparen. Besonders wichtig zu beachten ist dabei:

- ▼ Lernen Sie zu festgelegten Zeiten! Bestimmte Stunden werden dann von selbst zu Reizauslösern Ihrer Lernphasen (vgl. Kap 5.1: „Sinn der Zeitplanung“).
- ▼ Lernen Sie an einem festen Arbeitsplatz! Ein Schreibtisch, der ausschließlich zum Lernen genutzt wird, lässt diesen Platz zum Stimulus Ihrer Lernvorgänge werden (vgl. Kap. 4: „Der Arbeitsplatz“).
- ▼ Kultivieren Sie – in Grenzen – auch Ihre individuellen „Lernticks“ und „Spleens“ (z. B. bestimmte Kleidung bei der Arbeit, bestimmte Anordnung des Schreibmaterials oder bestimmte Körperhaltung)! Auch sie können als Reizauslöser das Lernen erleichtern.
- ▼ Lernen Sie in einem ablenkungsfreien Arbeitsumfeld! Alle Dinge, die nicht zum Lernen gehören (z. B. Handy, Souvenirs, Briefe, Zeitschriften oder der aktuelle Schmöcker), sollten „weggesperrt“ werden. Diese „Ablenker“ lassen sich gut als „Belohner“ bzw. „operante Reize“ (vgl. Kap 2.1.2: „Operantes Konditionieren“) einsetzen.

2.1.2 Operantes Konditionieren: Thorndikes Katzen und Skinners Tauben

So wichtig die Rolle gewohnheitsmäßigen Verhaltens im Leben auch ist, viele Lernvorgänge lassen sich darauf nicht zurückführen, sondern bedürfen einer anderen Erklärung. Wichtige Einsichten zum Lernen aufgrund von Versuch und Irrtum (trial and error) sowie zum Lernen am Erfolg verdanken wir den Arbeiten von Edward Thorndike (1874-1949) und Burrhus Skinner (1904-1990). Bei der sogenannten operanten Konditionierung geht man davon aus, dass Lernen nicht ausschließlich durch Verbinden von zwei zeitlich eng beieinander liegenden Ereignissen erfolgt, sondern dass Belohnung und Erfolg dem Lernen förderlich sind.

Die Versuche

Thorndike sperrte hungrige Katzen in kleine Käfige, die sich durch einen speziellen Mechanismus von innen öffnen ließen. Mehr oder weniger zufällig lösten die unruhigen Katzen irgendwann den Öffnungsmechanismus aus und gelangten an die vor den Käfigen befindlichen Futterstellen. Bei häufigeren Wiederholungen dieses Versuches lernten die Katzen in immer kürzeren Zeitabständen, die Käfige zu öffnen. Schließlich gelang es ihnen, unmittelbar nach dem Einsetzen in den Käfig den Öffnungsmechanismus zu betätigen und sich die Belohnung in Form des bereitgestellten Futters zu verschaffen.

Skinner knüpfte an diese Versuche an und dressierte Tauben. Die Tauben bekamen in ganz zufälligen Zeiträumen Futterkörner in den Käfig geworfen, die mit ebenso zufälligen Trippelschritten der Tauben zusammenfielen. In kürzester Zeit gelang es Skinner auf diese Art und Weise die Tauben zu den

skurrilsten Tänzen zu bringen, die er per Videokamera dokumentierte. Da diese neuen Bewegungsabläufe den Tauben durch den Einsatz des Mittels (=Instrument) Futter adressiert wurden, nennt man diese Lernart instrumentelles oder operantes Konditionieren.

Die Theorie

Skinner übertrug später die Erkenntnisse, die er bei seinen Taubenversuchen gewonnen hatte, auf menschliches Lernen. Die Tauben verbanden Futterabgabe und Bewegung ursächlich miteinander, indem sie die Futterabgabe als Belohnung für eine bestimmte Bewegung empfanden. Dieser Einsicht folgend zerlegte er nun größere Lerneinheiten in kleine Teilschritte, deren Bewältigung er unmittelbar belohnte. Er glaubte, dass bei Menschen als Belohnung in einem Frage-Antwort-Spiel die Bestätigung einer Antwort als „richtig“ ausreiche. Auf diesem Prinzip aufbauend, entwarf er in kleinste Einheiten unterteilte Lernprogramme, die als „programmierte Unterrichtsmethode“ weltweit bekannt wurden. Alle heute üblichen Lernmaterialien (z. B. Bücher, Computerprogramme, etc.) gehen auf dieses Grundprinzip des schrittweisen Lernens am unmittelbaren Erfolg zurück. Jetzt wird auch die folgende Definition des operanten Konditionierens, die wir dem Funkkolleg „Pädagogische Psychologie“ entnehmen, verständlich:

„Bei der operanten Konditionierung erlangt eine zunächst neutrale und oftmals zufällig auftretende Reaktion durch die nachfolgende Verstärkung für das Individuum eine bestimmte Bedeutung und tritt dadurch in der Folgezeit mit erhöhter Wahrscheinlichkeit auf.“ (Funkkolleg, SBB8, 1983, S.20).

Im weiteren wird bei Verstärkern zwischen positiven

und negativen Verstärkern unterschieden. Positive Verstärker sind Konsequenzen, die die Auftretenswahrscheinlichkeit einer Reaktion erhöhen, wenn sie der Situation zugeführt werden (z. B. Nahrung). Ein negativer Verstärker liegt dann vor, wenn er die Auftretenswahrscheinlichkeit einer Reaktion erhöht, wenn er aus der Situation entfernt wird (z. B. Schmerzen). Negative Verstärker werden häufig mit Bestrafung verwechselt, jene Reize, die die Auftretenswahrscheinlichkeit einer Reaktion senken, wenn sie der Situation zugeführt werden („Bestrafung Typ 1“ oder „positive Bestrafung“). Unter „negativer Bestrafung“ („Bestrafung Typ 2“) versteht man, dass ein positiver Reiz infolge des Auftretens einer bestimmten Verhaltensweise entfernt wird. Wie bei der klassischen Konditionierung sind auch hier die Kontinguität und die Kontingenz zwischen der Reaktion und ihren Folgen notwendige Bedingungen.

Die Anwendung

Die Einsicht, dass Erfolgserlebnisse und Belohnungen Lernen fördern, setzen gute Pädagogen in der Schule bewusst und Eltern bei der Erziehung ihrer Kinder intuitiv ein, indem sie erwünschte Verhaltensweisen der Schüler oder des Kindes belohnen und unerwünschte ignorieren (d. h. nicht verstärken). Jeder weiß aus Erfahrung, dass Erfolgserlebnisse nicht nur das individuelle Lernen fördern, sondern zugleich auch Selbstvertrauen erzeugen und zu größeren Aufgaben ermutigen. Verstärkt durch die Erfolgserlebnisse, werden die angestrebten Lernziele höher geschraubt oder neue gesetzt, womit häufig eine stärkere Motivation für das eigene Lernverhalten einhergeht. Auf Basis der Theorie der operationalen Konditionierung ergeben sich demnach folgende wichtige Tipps für die Lernpraxis.

Die Lerntipps

Für effizientes Lernen ist es wichtig, sich einen adäquaten Lernplan zu erstellen und sich während des Lernens selbst „auf die Schulter klopfen“ zu können. Wir werden Ihnen später noch konkrete Möglichkeiten hierzu aufzuzeigen. Als Beispiel sei die weiter unten ausführlich dargestellte Lernkartei genannt sowie Belohnungen, die Sie sich durch Einhalten Ihres Prüfungsplans (s. Kap. 6: „Prüfungsvorbereitung“), durch Erledigung bestimmter Tagesaufgaben und durch Erfolge bei der Bewältigung von Konzentrationsstörungen verschaffen können. Prinzipiell sollten Sie dabei immer folgende Grundregeln beachten:

- ▼ Verhaltensweisen werden gelernt, wenn sie durch Belohnung und Erfolg bekräftigt werden. Treffen Sie sich beispielsweise nach getaner Arbeit mit Freunden zum Kinobesuch!
- ▼ Die Belohnung muss, um wirksam zu werden, unmittelbar auf das gewünschte Verhalten folgen. Warten Sie nicht zu lange! Eine kurze Kaffeepause kann sofort eine schöne Belohnung sein.
- ▼ Zur Steigerung der Lerneffizienz sollten große Lerneinheiten sinnvollerweise in kleine Lernschritte unterteilt werden. Gliedern Sie z. B. große Kapitel in einem Lehrbuch in kleinere, besser überschaubare Einheiten!

Appendix H: Experiment 4

Content Relevance and Cue Giver Competence as Moderators of the Effect of Explicit Quality Information (3x2x2 Between-Subjects Design)

The between-subjects variations of **[low]** vs. **[moderate]** vs. **[high]** content relevance, **[low]** vs. **[high]** cue giver competence and explicit **[positive]** vs. explicit **[negative]** quality information are highlighted in bold type and differentiated with squared brackets and respective background colours.



Liebe Studierende,

herzlichen Dank, dass Sie die Arbeitsgemeinschaft Didaktik und Evaluation virtueller Lehre (AG DEViL) heute unterstützen und an der Evaluation einer computerbasierten Lernumgebung zum Thema Schlüsselqualifikationen teilnehmen. Wir möchten Sie zunächst genauer über die AG DEViL und die computerbasierte Lernumgebung informieren. Bitte lesen Sie die folgenden Informationen aufmerksam!

Seit 1997 ist die AG DEViL am Lehrstuhl für Erziehungswissenschaft II (Prof. Hofer) der Universität Mannheim in den Verbundprojekten "Virtuelle Hochschule Oberrhein" (VIROR; <http://www.viror.de>) und "Universitärer Lehrverbund Informatik" (ULI; <http://www.uli-campus.de>) für die pädagogisch-psychologische Beratung und Evaluation computerbasierter Lehrangebote zuständig.

Im Rahmen dieser Tätigkeit und in Kooperation mit **[den Lehrstühlen für Elektrotechnik und Maschinenbau der TU Cottbus]** / **[der Universität Hannover]** / **[der Universität Mannheim]** ist auch die computerbasierte Lernumgebung "SchlüsselQualifikationsTraining-online" ("SQT-online") entstanden, die Sie heute ausschnittsweise evaluieren sollen. Der Begriff Schlüsselqualifikationen/-kompetenzen bezieht sich auf fachübergreifende Fähigkeiten, die für die Berufsausübung wichtig sind (z.B. EDV, Projektmanagement, Vortragstechniken oder Fremdsprachen). "SQT-online" soll nun an der **[TU Cottbus im Rahmen einer professionalisierten Schlüsselqualifikationsausbildung für Elektrotechnik- und Maschinenbaustudenten]** / **[Universität Hannover im Rahmen einer professionalisierten Schlüsselqualifikationsausbildung]** / **[Universität Mannheim im Rahmen einer professionalisierten Schlüsselqualifikationsausbildung]** als Lernmaterial eingesetzt werden. Die Schlüsselqualifikationsausbildung wird ab dem kommenden Wintersemester 2004/05 für **[diese beiden Studiengänge an der TU Cottbus]** / **[sämtliche Studiengänge der Universität Hannover]** / **[sämtliche Studiengänge der Universität Mannheim]** verpflichtend ins Hauptstudium integriert.

Zur naechsten Seite

"SQT-online" Evaluation

Um die Qualität von "SQT-online" zu sichern, wenden wir uns heute mit der Bitte an Sie, ein Lernmodul aus "SQT-online" zu bearbeiten. Das Modul soll den Studierenden Lern- und Arbeitstechniken für Beruf und Studium vermitteln und basiert auf wissenschaftlichen Theorien und Befunden. Da es für eine umfassende Evaluation computerbasierter Lernumgebungen auch wichtig ist, genaue und realistische Informationen über die Teilnehmer zu erfassen, werden wir Sie zu verschiedenen Zeitpunkten um derartige Daten bitten. Als

erstes benötigen wir ein paar Angaben zu Ihrer Person sowie Ihren Gründen zur Teilnahme an unserer Studie.

1. Alter:

2. Geschlecht:

- ☐ männlich
☐ weiblich

3. Studienfach/ -fächer:

4. Abschlussziel:

- ☐ Diplom
☐ Magister
☐ Master
☐ Bachelor

5. Fachsemester:

Die nächsten drei Fragen beantworten Sie bitte, indem Sie die Antwortoption in der Antwortskala ankreuzen, die für Sie am Besten zutrifft. Die Antwortskala bietet Ihnen dabei einen Zustimmungsgrad von 0% = "stimme gar nicht zu" bis 100% = "stimme voll zu" an.

	stimme gar nicht zu 0%	20%	40%	60%	80%	stimme voll zu 100%
6. Ich werde das "SQT-online" Modul bearbeiten, weil der Inhalt für mich persönlich relevant ist.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Ich werde das "SQT-online" Modul bearbeiten, weil ich den Inhalt in meinem Studium verwenden kann.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Ich werde das "SQT-online" Modul nur bearbeiten, weil ich darum gebeten wurde.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Zur naechsten Seite

"SQT-online" Evaluation

Nun möchten wir Ihnen noch genauere Informationen zu "SQT-online" geben. Wie Sie aus dem unten dargestellten Zeitungsartikel [der Märkischen Allgemeinen Zeitung (MAZ)] / [der Hannoverschen Allgemeinen Zeitung] / [des Mannheimer Morgens] erschen können, ist "SQT-online" bereits von einem [Experten] / [Studierenden] didaktisch als [nicht optimal] / [besonders empfehlenswert] beurteilt worden. Genauere Informationen zu diesem Qualitätsurteil entnehmen Sie bitte dem markierten Paragraphen des Zeitungsartikels.

COPY OF THE CORRESPONDING BOGUS NEWSPAPER ARTICLE (SEE APPENDIX I)

Zur nächsten Seite

"SQT-online" Evaluation

Mit Ihrer Unterstützung nehmen wir jetzt ein Modul aus "SQT-online" (das Modul zu Lern- und Arbeitstechniken) nochmal genauer unter die Lupe. Mit einem Klick auf den Button haben Sie zuerst einmal eine Minute Zeit, sich einen kurzen Überblick über das Modul zu verschaffen. Danach wird sich ein Fenster öffnen und Sie werden gebeten eine erste Einschätzung des Moduls abzugeben. Das Modul ist als Hypertext angelegt, d.h. Sie können sich mit Klicks auf die entsprechenden Links durch das Modul blättern. Beachten Sie dabei, dass nur der Bereich "Klassische Lerntheorien" aktiv ist (d.h. der restliche Bereich des Lernmoduls "Moderne Lerntheorien" sowie die Einführung und die anderen Lernmodule "Lese- und Schreibtechniken", "Rhetorik und Präsentation" und "Projektmanagement" sind unzugänglich).

Zum SQT-Modul

"SQT-online" Evaluation

Nachdem Sie sich einen ersten Eindruck über das "SQT-online" Modul verschaffen konnten, möchten wir Sie bitten, diesen kurz im Folgenden festzuhalten.

Die nachfolgenden Fragen beantworten Sie bitte wieder, indem Sie die Antwortoption in der Antwortskala ankreuzen, die für Sie am Besten zutrifft. Die Antwortskala bietet Ihnen dabei einen Zustimmungsgrad von 0% = "stimme gar nicht zu" bis 100% = "stimme voll und ganz zu" an.

	stimme gar nicht zu 0%	20%	40%	60%	80%	stimme voll zu 100%
9. Ich stufe die Qualität des "SQT-online" Moduls als sehr hoch ein	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	stimme gar nicht zu 0%	20%	40%	60%	80%	stimme voll zu 100%
10. Ich glaube, dass man sich mit dem "SQT-online" Modul fundierte Kenntnisse über Lerntechniken aneignen kann.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Ich glaube, dass man mit dem "SQT-online" Modul sehr gut lernen kann.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Ich glaube, dass das "SQT-online" Modul kein sinnvolles Wissen über Lerntechniken vermittelt.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Vielen Dank!

Klicken Sie unten, um wieder zum "SQT-online" Modul weitergeleitet zu werden. Bitte bearbeiten Sie das "SQT-online" Modul im Anschluss sorgfältig und selbständig. Sie haben dazu maximal 35 Minuten Zeit. Wenn die Lernzeit abgelaufen ist, werden Sie automatisch zu den abschließenden Fragen zur Qualität und zum Inhalt des "SQT-online" Moduls weitergeleitet. Sollten Sie vor Ablauf der 35 Minuten mit der Bearbeitung dieser Fragen beginnen wollen, dann klicken Sie bitte auf den Button "ABBRUCH". Dieser befindet sich auf der Modulstartseite "Klassische Lerntheorien". Beachten Sie dabei bitte, daß Sie dann keine Möglichkeit mehr haben den Lerntext erneut aufzurufen.

Zum SQT-Modul

Liebe Studierende,

Nachdem Sie das "SQT-online" Modul bearbeitet haben, möchten wir Sie nun bitten, zunächst einige Fragen zu Ihrer Bewertung und Bearbeitung des "SQT-online" Moduls zu beantworten!

Zur nächsten Seite

"SQT-online" Evaluation

Die nachfolgenden Fragen beantworten Sie bitte wieder, indem Sie die Antwortoption in der Antwortskala ankreuzen, die für Sie am Besten zutrifft. Die Antwortskala bietet Ihnen dabei einen Zustimmungsgrad von 0% = "stimme gar nicht zu" bis 100% = "stimme voll und ganz zu" an.

	stimme gar nicht zu 0%	20%	40%	60%	80%	stimme voll zu 100%
13. Ich stufe das "SQT-online" Modul als sehr gut ein.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Bevor ich das "SQT-online" Modul beendet habe, habe ich mir Zeit genommen, alle wichtigen Inhalte noch einmal durchzugehen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Ich habe ein Schaubild oder ähnliche Visualisierungen des Textinhalts erstellt, um den Lernstoff besser strukturiert vorliegen zu haben.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. Ich habe versucht, zur Verdeutlichung der neuen Begriffe und Theorien konkrete Beispiele zu finden.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. Ich habe versucht, zur Verdeutlichung der neuen Begriffe und Theorien konkrete Beispiele zu finden.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. Ich halte das "SQT-online" Modul für stark verbesserungsbedürftig.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. Ich habe die wichtigsten Begriffe und Definitionen auswendig gelernt, um mich so an die Inhalte wieder erinnern zu können.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. Ich würde das "SQT-online" Modul anderen Studierenden auf jeden Fall weiterempfehlen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21. Ich habe versucht, die neue Information mit relevantem, bereits vorhandenem Wissen zu verbinden.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. Ich habe eine Gliederung des Lernstoffes angefertigt, um so einen besseren Überblick zu bekommen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23. Ich habe sofort begonnen, das „SQT-online“ Modul intensiv zu bearbeiten.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24. Ich glaube, dass das "SQT-online" Modul überhaupt nicht relevant für studiums- oder berufsbezogene Lerntechniken ist.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25. Ich habe mir die wichtigen Inhalte aus dem "SQT-online" Modul herausgeschrieben und auswendig gelernt.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26. Ich habe versucht den Lernstoff so zu ordnen, dass ich ihn mir gut einprägen kann.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27. Ich habe das neu Gelernte auf meine eigenen Erfahrungen bezogen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

28. Ich habe bei schwierigen Textstellen im "SQT-online" Modul nicht aufgegeben und sie so lange bearbeitet, bis ich sie verstanden habe. ☐ ☐ ☐ ☐ ☐ ☐
29. Ich habe mir manche der Inhalte bildlich vorgestellt. ☐ ☐ ☐ ☐ ☐ ☐
30. Ich habe am Ende jeder Seite versucht, mir den Inhalt noch mal in Gedanken auswendig vorzusagen. ☐ ☐ ☐ ☐ ☐ ☐
31. Ich habe überlegt, ob der Lernstoff auch für mein Alltagsleben relevant ist. ☐ ☐ ☐ ☐ ☐ ☐
32. Ich habe mich sehr angestrengt, den Inhalt des "SQT-online" Moduls zu lernen. ☐ ☐ ☐ ☐ ☐ ☐
33. Ich habe mir den Lernstoff durch wiederholtes Durchlesen eingeprägt. ☐ ☐ ☐ ☐ ☐ ☐
34. Ich habe in eigenen Worten eine Kurzzusammenfassung des "SQT-online" Moduls geschrieben, um den Inhalt besser lernen zu können. ☐ ☐ ☐ ☐ ☐ ☐

Zur nächsten Seite

"SQT-online" Evaluation

Bitte beantworten Sie nun die folgenden Fragen zum Inhalt des "SQT-online" Moduls. **Bitte markieren Sie jeweils die EINE richtige Antwortalternative.** Sollten Sie eine Frage nicht beantworten können, so markieren Sie dies bitte jeweils entsprechend mit der Antwortoption e).

1. Die in dem Text angeführten Versuche von Thorndike wurden mit welchen Versuchstieren gemacht?

- ☐ a) Hunde
- ☐ b) Tauben
- ☐ c) Katzen
- ☐ d) Mäuse
- ☐ e) kann ich nicht beantworten

2. Welche der folgenden Empfehlungen können auf der Basis der Theorie der operanten Konditionierung zur Verbesserung des Lernverhaltens gegeben werden?

- ☐ a) Komplexe Lerninhalte müssen anschaulich dargestellt werden
- ☐ b) Komplexe Lerninhalte müssen unterteilt werden
- ☐ c) Komplexe Lerninhalte müssen eine deutlich erkennbare Alltagsrelevanz besitzen
- ☐ d) Komplexe Lerninhalte müssen aus verschiedenen Perspektiven betrachtet werden
- ☐ e) kann ich nicht beantworten

3. Beim operanten Konditionieren resultieren Verhaltensänderungen aus Ereignissen, die stattfinden

- ☐ a) vor dem Verhalten
- ☐ b) unmittelbar nach dem Verhalten
- ☐ c) parallel zu dem Verhalten
- ☐ d) lange Zeit nach dem Verhalten
- ☐ e) kann ich nicht beantworten

4. Der Speichelfluss der Tiere beim Ertönen des Klingelzeichens in Abwesenheit der Nahrung in Pawlows Experiment wird bezeichnet als:

- ☐ a) unconditionierter Reflex
- ☐ b) bedingte Reaktion
- ☐ c) neutraler Reflex
- ☐ d) indifferenter Reflex
- ☐ e) kann ich nicht beantworten

5. Wer hat die ersten Versuche zum operanten Konditionieren durchgeführt?

- ☐ a) Skinner
- ☐ b) Thorndike
- ☐ c) Pawlow
- ☐ d) Watson
- ☐ e) kann ich nicht beantworten

6. Beim operanten Konditionieren wird Verhalten verändert durch:

- ☐ a) zugrunde liegende Verhaltensmotive
- ☐ b) die Konsequenzen, die es nach sich zieht
- ☐ c) die Beobachtung von anderen, die dieses Verhalten ausführen
- ☐ d) das Verbinden von einem bedingtem mit einem unbedingtem Reiz
- ☐ e) kann ich nicht beantworten

7. Eine neue Reaktion wird nicht gelernt durch:

- ☐ a) Operantes Konditionieren
- ☐ b) Versuch und Irrtum
- ☐ c) Klassisches Konditionieren
- ☐ d) irgendeine Art der Konditionierung
- ☐ e) kann ich nicht beantworten

8. Bei der negativen Verstärkung besteht

- ☐ a) ein negativer Zusammenhang zwischen Verhalten und unangenehmer Konsequenz, die zu einer Abnahme der Verhaltensrate führt
- ☐ b) ein negativer Zusammenhang zwischen Verhalten und unangenehmer Konsequenz, die zu einer Zunahme der Verhaltensrate führt
- ☐ c) ein positiver Zusammenhang zwischen Verhalten und unangenehmer Konsequenz, die zu einer Abnahme der Verhaltensrate führt
- ☐ d) ein positiver Zusammenhang zwischen Verhalten und unangenehmer Konsequenz, die zu einer Zunahme der Verhaltensrate führt
- ☐ e) kann ich nicht beantworten

9. Die unten beschriebenen Konditionierungsketten beziehen sich auf die im Text dargestellte Untersuchung Pawlows. Füllen Sie die Lücken mit den entsprechenden konditionierungstheoretischen Fachbegriffen.

Vor der Konditionierung:

9.1. Futter =



9.2. Speichelfluß =

9.3. Glocke =



Keine Reaktion

Nach der Konditionierung:

9.4. Glocke =



9.5 Speichelfluß =

10. Um die Effektivität einer Belohnung zu maximieren, sollte sie zeitlich wie mit dem gewünschten Verhalten auftreten:

- ☐ a) unmittelbar danach
- ☐ b) unmittelbar davor
- ☐ c) gleichzeitig
- ☐ d) mit ausreichendem Abstand
- ☐ e) kann ich nicht beantworten

11. Das Prinzip der Kontingenzt bezieht sich auf

- ☐ a) das Ausmaß mit dem der konditionierte Reiz den unkonditionierten Reiz vorhersagt
- ☐ b) die unmittelbare Folge des neutralen Reiz auf den konditionierten Reiz
- ☐ c) die räumliche Nähe zwischen konditioniertem und unkonditioniertem Reiz
- ☐ d) die zeitliche Nähe zwischen konditioniertem und unkonditioniertem Reiz
- ☐ e) kann ich nicht beantworten

12. Die Hunde in Pawlows Experiment sonderten Speichel beim Klingelzeichen ab. Das Klingelzeichen war dabei

- ☐ a) der indifferente Reiz
- ☐ b) der unkonditionierte Reiz
- ☐ c) der neutrale Reiz
- ☐ d) der konditionierte Reiz
- ☐ e) kann ich nicht beantworten

Zur nächsten Seite

Liebe Studierende,

zum Abschluss bitten wir Sie, noch ein paar kurze Fragen zu unserer Studie zu beantworten. Bitte markieren Sie bei den ersten beiden Fragen jeweils nur eine Antwortoption!

1. In dem Zeitungsartikel wurde „SQT-online“ wie beurteilt:

- ☐ als didaktisch besonders empfehlenswert
- ☐ als didaktisch empfehlenswert
- ☐ als didaktisch nicht optimal
- ☐ als didaktisch bedingt geeignet

2. Wie hoch schätzen Sie die Expertise der Person ein, die dieses Qualitätsurteil über „SQT-online“ gefällt hat?

- ☐ sehr hoch
- ☐ hoch
- ☐ gut
- ☐ zufriedenstellend
- ☐ ausreichend
- ☐ gering
- ☐ sehr gering

3. Fassen Sie bitte noch einmal in eigenen Worten das Ziel der Studie zusammen.

Zur nächsten Seite

Nochmals vielen Dank für Ihre Unterstützung! Bitte informieren Sie den Versuchsleiter, dass Sie fertig sind!

Appendix I: The Twelve Versions of the Bogus Newspaper Article Used in Experiment 4

Bogus newspaper article containing low content relevance information, high cue giver competence information and explicit negative quality information about the instructional medium to be used:

TU Cottbus bald näher an der Praxis

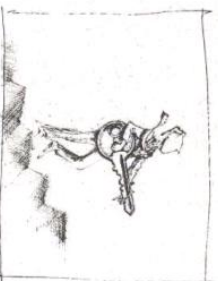
Schlüsselkompetenzen für Elektro- und Maschinenbauingenieure als Pflichtfach

Von unserer Mitarbeiterin
Andrea Wirth

Cottbus. Unternehmen fordern von Ingenieuren stärker denn je Schlüsselkompetenzen wie Kommunikations- und Teamfähigkeit. Um Studierende des Ingenieurwesens besser an das Berufsleben heranzuführen, stellt sich für die TU Cottbus die Frage: Wie kann man Schlüsselkompetenzen überhaupt vermitteln?

Die TU Cottbus, die vor kurzem erst vom *Centrum für Hochschulentwicklung* (CHE) als „best-practice“ Hochschule 2003 für ihren Reformkurs in Hochschulmanagement, Forschung und Lehre ausgezeichnet wurde, ist hier wieder einen Schritt voraus.

An den Lehrstühlen für Elektrotechnik und Maschinenbau wird ab dem Wintersemester 2004/05 eine umfassende und teilweise computerbasierte Schlüsselqualifikationsausbil-



dung angeboten, die für die Studenten dieser Fachbereiche verpflichtend ins Studium integriert und deren erfolgreicher Abschluss mit einem Zertifikat belegt wird. So sollen zukünftige Ingenieure praxisnäher und zugleich auf hohem wissenschaftlichen Niveau ausgebildet werden.

Für eine Sicherung der qualitativen Standards sorgt schon während der Entwicklungsphase der Ausbildungsinhalte die päd-

agogische Bewertung sämtlicher Seminarbausteine. So wird nicht nur der Aufbau der Seminare nach pädagogischen Gesichtspunkten konzipiert, sondern auch die gesamten Lernmaterialien werden von unabhängigen Experten vorab begutachtet und bewertet.

Dabei wird auch Kritik laut. So beurteilt einer der externen Gutachter, Prof. Dr. Jürgen Baumann, Leiter des Max-Planck-Instituts für Bildungsforschung in Berlin, die in Kooperation mit der Universität Mannheim entwickelte Lernsoftware „SchlüsselqualifikationsTraining Online“ (SQT) als didaktisch nicht optimal: „Im Vergleich zu anderen thematisch ähnlichen computerbasierten Lernumgebungen zeigte sich, dass das SQT inhaltlich unklar und schlecht strukturiert, dabei noch sehr theorielastig und wenig praxisnah ist.“

Eine derart objektive und systematische Vorgehensweise würde wohl so mancher traditionellen Hochschulausbildung gut tun.

Bogus newspaper article containing low content relevance information, high cue giver competence information and explicit positive quality information about the instructional medium to be used:

TU Cottbus bald näher an der Praxis

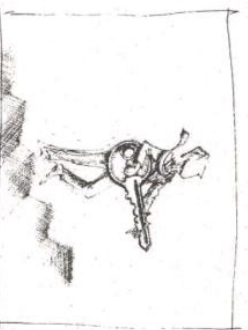
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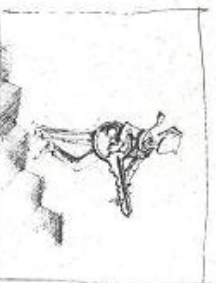
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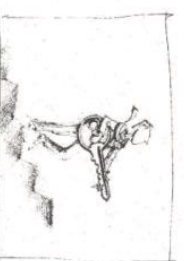
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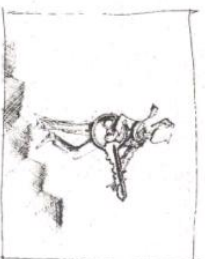
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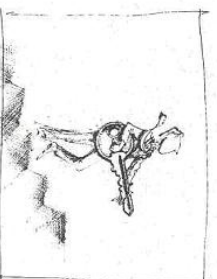
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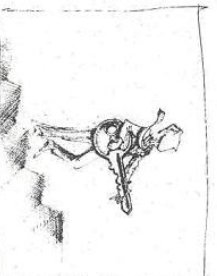
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des Rektorats wird nun ab dem Wintersemester 2004/05 eine umfassende und teilweise computerbasierte Schlüsselqualifikationsausbildung angeboten, die für die Studenten aller Fachbereiche verpflichtend ins Studium integriert und deren erfolgreicher Abschluss mit einem Zertifikat belegt wird. So sollen Studierende praxisnäher und zugleich auf hohem wissenschaftlichen Niveau ausgebildet werden.

Für eine Sicherung der qualitativen Standards sorgt schon während der Entwicklungsphase der Ausbildungsinhalte die pädagogische Bewertung sämtlicher Seminarbausteine. So wird nicht nur der Aufbau der Seminare nach pädagogischen Gesichtspunkten kontrolliert, sondern auch die gesamten Lernmaterialien werden von Studierenden vorab begutachtet und bewertet.

Als didaktisch besonders empfehlenswerte Lernsoftware beurteilt Jens Roth, Jurastudent im zweiten Semester, die in Kooperation mit der Universität Mannheim entwickelte Lernsoftware „SchlüsselqualifikationsTraining Online“ (SQT). Im Vergleich zu anderen thematisch ähnlichen computerbasierten Lernumgebungen empfand ich das SQT als inhaltlich klar und strukturiert sowie theoretisch fundiert und dennoch sehr praxisnah.

Eine derart objektive und systematische Vorgehensweise wurde wohl so mancher traditionellen Hochschulausbildung gut tun.

Appendix J

Appendix J: The Instructional Medium Used in Experiment 4

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Die Anwendung

Klassische Lerntheorien

Die klassische Lernpsychologie unterscheidet zwei elementare Formen des Lernens, von denen sich wichtige Tipps für effizientes Lernen in der Praxis ableiten lassen:

- das klassische Konditionieren.
- das operante oder instrumentelle Konditionieren

ABBRUCH

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Die Anwendung

Klassisches Konditionieren: Pawlows Hunde

Der Versuch

Der russische Physiologe Iwan Pawlow (1849-1936) entwickelte seine Theorie der klassischen Konditionierung unter anderem auf der Basis seiner Untersuchungen des Speichelflusses von Hunden während der Nahrungsaufnahme. Dabei maß er die Speicheldrüse, die sich regelmäßig bei der Nahrungsaufnahme als unkontingenter Reflex auf den unkontingierten Reiz Nahrung bei den Hunden einstellte.



Iwan Pawlow (1849-1936)

Im weiteren Verlauf des Versuches verband er ein Klingelzeichen mit der regelmäßigen Nahrungszufuhr. Nach 25maliger Wiederholung des Versuches ertönte nur noch das Klingelzeichen, ohne dass Nahrung bereitgestellt wurde. Dennoch sonderten die Hunde auf den ursprünglich indifferenten Reiz „Klingelzeichen“ Speichel ab, ein Reflex, den Pawlow als bedingte oder konditionierte Reaktion bezeichnete.

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Third page of the hypertext:

Klassisches Konditionieren: Pawlows Hunde

Die Theorie

Das klassische Konditionieren beschreibt also den Prozess der Verknüpfung einer Verhaltensweise mit einem a priori neutralen Reiz bzw. Stimulus. Die Hunde hatten gelernt, ihr Verhalten auf das Klingenzeichen hin in bestimmter Weise zu ändern; sie waren auf das neue Zeichen „konditioniert“.

Ablauf des Pawlawaschen Experiments

UKS 	UKR 	NS 	keine Reaktion
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Fourth page of the hypertext:

Klassisches Konditionieren: Pawlows Hunde

Die Anwendung

Generell kann angenommen werden, dass viele unserer emotionaler Reaktionen und Einstellungen gegenüber Umweltreizen durch klassische Konditionierung erworben werden. Besonders in der frühen Kindheit beruhen viele Lernvorgänge auf diesem Prinzip. Ähnlich wie Pawlows Hunde lernen wir, auf zunächst neutrale Reize in bestimmter Weise zu reagieren. Nur wer „richtig“ konditioniert ist, reagiert auch entsprechend „richtig“. Die meisten Verhaltensweisen, die wir als Gewohnheiten bezeichnen, sind Ergebnisse konditionierter Reaktionen auf Reize, die für uns Signalfunktion erlangt haben und auf die wir gleichbleibend in konditionierter Art reagieren. So können auch in der Schule lernbezogene emotionale Reaktionen durch klassisches Konditionieren entstanden sein, die langfristige Folgen für das spätere Lernverhalten haben (z. B. Lernfreude bzw. Schul- und Prüfungsangst). Obwohl das klassische Konditionieren keine umfassende Erklärung für das Lernverhalten Erwachsener liefert, so lassen sich daraus doch einige wichtige Tipps für erfolgreiches Lernen ableiten.

Um die Lern Tipps zu betrachten, klicken Sie bitte [hier](#).

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Operantes Konditionieren: Pawlows Hunde

Die Lern Tipps

Für effizientes Lernen ist es wichtig, dass Sie Ihr Lernverhalten zum einen auf negative Gewohnheiten hin analysieren und diese beseitigen und sich zum anderen bestimmte positive Gewohnheiten und Lernstrategien aneignen, die Ihnen die Kontinuität im Lernen erleichtern und Ihnen ständig neue Entscheidungen im Lernprozess ersparen. Besonders wichtig zu beachten ist dabei:

- Lernen Sie zu festgelegten Zeiten! Bestimmte Stunden werden dann von selbst zu Reizauslösern Ihrer Lernphasen (vgl. Projektmanagement, Abschnitt: Zeitplanung).
- Lernen Sie an einem festen Arbeitsplatz! Ein Schreibtisch, der ausschließlich zum Lernen genutzt wird, lässt diesen Platz zum Stimulus Ihrer Lernvorgänge werden.
- Kultivieren Sie – in Grenzen – auch Ihre individuellen „Lern ticks“ und „Spielen“ (z. B. bestimmte Kleidung bei der Arbeit, bestimmte Anordnung des Schreibmaterials oder bestimmte Körperhaltung!) Auch sie können als Reizauslöser das Lernen erleichtern.
- Lernen Sie in einem ablenkungsfreien Arbeitsumfeld! Alle Dinge, die nicht zum Lernen gehören (z. B. Handy, Souvenirs, Briefe, Zeitschriften oder der aktuelle Schmucker), sollten „weggespart“ werden. Diese „Ablenker“ lassen sich gut als „Belohnen“ bzw. „operante Reize“ (vgl. Abschnitt: Operantes Konditionieren) einsetzen.

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Operantes Konditionieren: Thorndikes Katzen und Skinners Tauben

So wichtig die Rolle gewohnheitsmäßigen Verhaltens im Leben auch ist, viele Lernvorgänge lassen sich darauf nicht zurückführen, sondern bedürfen einer anderen Erklärung. Wichtige Einsichten zum Lernen aufgrund von Versuch und Irrtum (trial and error) sowie zum Lernen am Erfolg verdanken wir den Arbeiten von Edward Thorndike (1874-1949) und Burrhus Skinner (1904-1990). Bei der sogenannten operanten Konditionierung geht man davon aus, dass Lernen nicht ausschließlich durch Verbinden von zwei zeitlich eng beieinander liegenden Ereignissen erfolgt, sondern dass Belohnung und Erfolg dem Lernen förderlich sind.

 Edward Thorndike (1874-1949)

 Burrhus Skinner (1904-1990)

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Operantes Konditionieren: Thorndikes Katzen und Skinners Tauben

Die Versuche

Thorndike sperrte hungrige Katzen in kleine Käfige, die sich durch einen speziellen Mechanismus von innen öffnen ließen. Mehr oder weniger zufällig lösten die unruhigen Katzen irgendwann den Öffnungsmechanismus aus und gelangten an die vor den Käfigen befindlichen Futterstellen. Bei häufigeren Wiederholungen dieses Versuchs lernten die Katzen in immer kürzerer Zeit das Öffnen des Käfigs zu lösen, schließ gelang es ihnen, unmittelbar nach dem Einsetzen der Futterbelohnung den Öffnungsmechanismus zu betätigen und sich die Belohnung in Form des bereitgestellten Futters zu verschaffen.

Skinner knüpfte an diese Versuche an und dressierte Tauben. Die Tauben bekamen in ganz zufälligen Zeiträumen Futterkörner in den Käfig geworfen, die mit ebenso zufälligen Trippelschritten der Tauben zusammenfielen. In kürzester Zeit gelang es Skinner auf diese Art und Weise die Tauben zu den kürzesten Tänzen zu bringen, die er bei Videoaufnahme festhielt. Diese neuen Bewegungsabläufe der Tauben durch den Einsatz des Mittels Futter belohnt wurden. Dressiert wurden, nennt man diese Lernernt Instrumentelles oder operantes Konditionieren.

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Bei der operanten Konditionierung erlangt eine zunächst neutrale und oftmals zufällig auftretende Reaktion durch ein bestimmtes Stimulus-Paarung eine bestimmte Bedeutung und tritt dadurch in der Folgezeit mit erhöhter Wahrscheinlichkeit auf.
(Funkkolleg, SS88, 1988, S.20).

Im weiteren wird bei Verstärkern zwischen positiven und negativen Verstärkern unterschieden. Positive Verstärker sind Konsequenzen, die die Auftretenswahrscheinlichkeit einer Reaktion erhöhen, wenn sie die Situation zugeführt werden (z.B. Nahrung). Eine negative Verstärkung liegt dann vor, wenn ein Verhalten durch den Wegfall eines unangenehmen Reizes vermehrt gezeigt wird (z.B. Schmerzen). Negative Verstärker werden häufig mit Bestrafung verwechselt, jene aber nicht, da die Blockierungswahrscheinlichkeit einer Reaktion sinken, wenn sie in der Situation auftreten (z.B. Schmerzmittel gegen Zahnschmerzen). Bestrafung ist also nur eine Form der Bestrafung“ („Bestrafung Typ 2“) versteht man, dass ein positiver Reiz infolge des Auftretens einer bestimmten Verhaltensweise entfernt wird. Wie bei der klassischen Konditionierung sind auch hier die Kontinuität und die Kontingenz zwischen der Reaktion und ihren Folgen notwendige Bedingungen.

Ninth page of the hypertext:

Die Anwendung

Die Einsicht, dass Erfolgergebnisse und Belohnungen Lernen fördern, setzen gute Pädagogen in der Schule bewusst und Eltern bei der Erziehung ihrer Kinder intuitiv ein, indem sie erwünschte Verhaltensweisen der Schüler oder das Kindes belohnen und unerwünschte ignorieren (d. h. nicht verstärken). Jeder weiß aus Erfahrung, dass Erfolgergebnisse nicht nur das individuelle Lernen fördern, sondern zugleich auch Selbstvertrauen erzeugen und zu größeren Aufgaben ermutigen. Verstärkt durch die Erfolgergebnisse, werden die angestrebten Lernziele höher geschraubt oder neue gesetzt, womit häufig eine stärkere Motivation für das eigene Lernverhalten einhergeht. Auf Basis der Theorie der operationalen Konditionierung ergeben sich demnach folgende wichtige Tipps für die Lernpraxis.

Um die Lerntipps zu beachten, klicken Sie bitte [hier](#).

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Tenth page of the hypertext:

Die Lerntipps

Für effizientes Lernen ist es wichtig, sich einen adäquaten Lernplan zu erstellen und sich während des Lernens selbst, auf die schulter klopfen zu können. Wir werden Ihnen später zeigen, wie das gelingt. Als Beispiel nehmen wir das selbstständige Lernen an. Es geht um die Belohnungen, die Sie sich durch Einhalten Ihres Prüfungsplans (vgl. Projektmanagement, Abschnitt: Prüfungsvorbereitung), durch Erledigung bestimmter Tagesaufgaben und durch Erfolge bei der Bewältigung von Konzentrationsstörungen verschaffen können. Prinzipiell sollten Sie dabei immer folgende Grundregeln beachten:

- Verhaltensweisen werden gelernt, wenn sie durch Belohnung und Erfolg bekräftigt werden. Treffen Sie sich beispielsweise nach getaner Arbeit mit Freunden zum Kinobesuch!
- Die Belohnung muss, um wirksam zu werden, unmittelbar auf das gewünschte Verhalten folgen. Warten Sie nicht zu lange! Eine kurze Kaffeepause kann sofort eine schöne Belohnung sein.
- Zur Steigerung der Lerneffizienz sollten große Lerneinheiten sinnvollerweise in kleine Lernschritte unterteilt werden. Gliedern Sie z. B. große Kapitel in einem Lehrbuch in kleinere, besser überschaubare Einheiten!

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Eidesstattliche Erklärung

Ich erkläre ehrenwörtlich, dass ich meine Arbeit ohne fremde Hilfe angefertigt habe und dass ich die Übernahme wörtlicher Zitate aus der Literatur sowie die Verwendung der Gedanken anderer Autoren an den entsprechenden Stellen innerhalb der Arbeit gekennzeichnet habe. Ich bin mir bewusst, dass eine falsche Erklärung rechtliche Folgen haben wird.

Mannheim, 10.03.2006

Charlotte Haimerl